Integrating multiple streams of operational improvements within a small company in pursuit of competitive supplier status

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By

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Abstract

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In order to sustain a competitive position in the international markets in which we trade my small manufacturing enterprise must improve its operational performance. How to effect such major performance improvements in a context of having limited resources to devote to a change programme is the research problem addressed within this thesis.

A Literature Review was conducted allied to four areas of operational improvement: (1) satisfying target customers' quality requirements; (2) achieving competitive supplier status with target customers; (3) constructing an effective relationship with the organisation's suppliers; and (4) motivating employees for better performance. Whilst the literature review suceeded in identifying improvement practices in each of the four areas, the firm lacks the resources to initiate four separate streams of improvement activity. Therefore, the key methodological challenge of this DBA research was to integrate the four streams of knowledge from existing studies in order to effect a systemic improvement in operational performance.

The research objectives were firstly, at a systemic level, to determine what and how management activities should be re-organised for sustaining high performance in the context of limited firm resources. The second objective, at the operational level, was to identify specific actions for improvement within the four areas noted above.

Checkland's Soft System Methodology (SSM) was adopted as the action research methodology for my empirical work. This methodology is particularly suited to the research objectives as it involves a systemic evaluation of an operation whilst also enabling the identification of specific improvement actions.

This thesis presents an evaluation of operational performance and the identification of actions for improvement that resulted from an application of SSM to my research problem. In addition, the impact on operational performance after six months is reported following the implementation of all the recommended actions.

Implications of the study are drawn for management practice in contexts of small businesses like my firm, with limited resources for solving problems with different key stakeholders. Finally, reflections are offered on the impact of this research project for my own professional practice.

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Chapter 1. Introduction

My organisation is a typical small but rapidly growing manufacturing enterprise, equipped with advanced Computerised Numerical Control (CNC) machines and the experienced engineers and operators needed for precision machining of metal components, mainly for international buyers. However, unlike large organizations, it is rather challenging for my organization to achieve competitive advantage in international market. The limited resources available to a small business means it is difficult to make big changes for expected operational improvements.

In their study, Jutla et al. (2002) considered small to medium sized firms (SMEs) as the backbone of economic growth in all countries because they account for 80 percent of global economic growth. In the past two decades, SMEs have achieved rapaid and sustainable growth, which has increasely contributed to China's economic development. Like SMEs in other areas of East Asia, SMEs in China also contribute substantially to the manufactured exports. So, I expect my DBA research will be relevant to other SMEs in China seeking to make significant operational improvements effectively in pursuit of competitive advantage in international markets.

As a small private business in machining of metal components, my organiztion's original organizational goal was to grow into a medium or even big business as the priority, with all workshops equipped with production lines for large scale productions. So, like many other small Chinese factories in international trade, to grow the business as much as possible my organisation was previously dedicated mainly to supplying one foreign customer, who purchased large quantities of standard or commonly used low-end machined components from us, which accounted for over 65% of sales of my organization. This customer was treated as the first priority, and as long as we kept the prices as low as possible, the customer committed to place us more and more purchase orders. They were not concerned about the work conditions for staff members in the organisation; to meet this customer's large purchases, three shifts were arranged to keep all the machines running almost 24 hours per day. Although the profit margin was very low, owing to the high volume of orders continuously placed by this customer, the management of the organisation was confident about its

future. However, immediately after 2011 and up to the start of my thesis project in 2014, due to the impact of the recent worldwide economic recession, this customer progressively cancelled all scheduled purchase orders, leaving unpaid half-finished components in the workshops and finished components in the warehouses and almost bankrupting the organisation. Fortunately, with irregular purchase orders from other relatively small customers, it has kept going, but the current effectiveness of the business is much lower than reasonable, with no competitive advantage in the long term.

To learn a serious lesson and re-develop its European and North American markets to achieve a sustainable business, the organisation has recently had a review of the existing strategy for developing international markets, using the serious issue we encountered as a study case. As the outcome of this review, it has been collectively agreed that the following are the three new organisational goals for future:

a) Instead of growing the business as big as possible, becoming a high-end supplier should be the priority;

b) Instead of having a single important customer, a broad customer base must be developed from among highly professional and technical companies in mechanical engineering industries that purchase high-end components designed by themselves, so that an interdependent partnership can be established and maintained; and

c) A reasonable profit margin must be achieved to maintain a healthy business with competitive advantage in the long term.

In other words, a business with competitive advantage in the long term is more important than increasing the size of the business. With these organizational goals to be achieved, it's expected that the 65% remaining capacity left by the single previous customer could be filled with multiple high-end customers and a reasonable profit margin in future, which are crucial for my organization to obtain long-term competitive advantage and survive in future. Furthermore, as argued at the Board meeting when the new strategy was discussed, these three goals were regarded as "strategic" rather than "tactical" because they required a systemic re-configuration of

the operation, and not just a focussed performance improvement in one small area. The crucial question then is: to achieve long-term competitive advantage, what should be done now and how can these desired goals be realised?

As the Director of European and North American Market Development, and with the advantage of European experiences and an academic background, I was empowered by the board of directors to conduct in-depth research into the management of the organisation.

1.1 Identifying the research problem

In either management research or management practice, it is probably not realistic to expect to clear all potential barriers and achieve all desired goals immediately. Instead, sufficient time will be required, with a route map of which goal might be the priority for the short-term future and could then become the robust basis for other goals to be achieved in the longer term. So, to confirm where the research should start from as its initial focus, an additional board meeting was held to discuss (a) what might be the motivation and deep desire underlying these three organisational goals, (b) what the expected timescale might be for achieving these goals, and (c) what the route map might be for achieving these goals. As the outcome of this board meeting, the consensus was as follows:

The motivation and deep desire underlying these three organisational goals: to become a high-end supplier and avoid a repeat of how we ran the business before 2011. At that time, we were dedicated to the single key customer as their cheap factory, without carefully considering the potential risk; consequently, after the worldwide economic recession, we were discarded without any concern. Instead, we should turn to making high-quality and reasonably priced products for multiple customers. Our relationship with future customers needs to be developed as an interdependent one, with expertise being recognised on both sides. Instead of just being selected as a supplier by customers, we want to develop future customers so that we could maintain a truly equal relationship , although we would still need to satisfy customers in terms of cost, quality, delivery time and service, as is common sense in business. Furthermore, reasonable profitability must be achieved, which we

think is the only approach to reach a high level of business effectiveness. Importantly, to survive for the future, any of these three goals must directly contribute to a business with competitive advantage in long term for our organisation.

The expected timescale for achieving these three organisational goals: we are aware that it is realistic to have separate timescales for achieving these separate goals in a sequence. As collectively agreed, after we have finalised actions needed for transforming into a high-end supplier, we hope to spend at least two years to develop a multiple-key-customer base, and at least three years to reach the reasonable level of profitability as desired.

The route map for achieving these three organisational goals: establishing sustainable high-end supplier status would be the basis for then developing multiple key customers and achieving a reasonable profit margin. So, becoming a high-end supplier should be the first goal we must achieve as soon as possible, and how to become a high-end supplier should be the necessary and realistic focus for a management research project.

In China, most small CNC machining enterprises in international trade, including the organisation, play the role of cheap factories and the supplier-buyer relationship is totally dominated by international customers. It is important to be aware of issues related to satisfying the expectations of potential customers. The three goals decided at the strategic review express the Board's perception of how our performance needed to change in order to avoid a repeat of the near business failure. The new strategy recognised that that it was not realistic to achieve all these three goals together at the same time immediately due to different timescale to be needed by each goal. Rather, the first milestone would be to become a more competitive supplier prior to achieving the other goals. In relation to achieving this milestone, the Board defined "high-end" or "competitive supplier status" as displaying advantages valued by our customers in comparison to our competitors. So, based on the outcome of this board meeting, as the research issue identified for my research, the first goal the organisation is keen to achieve immediately is *to improve our current capability as a low-end supplier to an effective high-end status*, so that an interdependent, equal and reliable relationship can be developed in the future between the organisation and

future key customers who source high quality products internationally at reasonable pricing level, and this may maintain competitive advantage in the long term.

Accordingly, the strategic issue identified and discussed above provide the basis for overarching research question for my thesis project: *How can a small low-end manufacturing enterprise (with limited resources) operating in the international business environment transform itself to achieve a competitive high-end supplier status that may maintain competitive advantage in the long term?*

1.1.1 The significance of the identified problem

In any organisation, to improve supplier status means that many changes have to be made in terms of cost, quality, delivery time and service, so the research problem cannot be solved by taking a single and definite action immediately; instead, there might be many human activities from different departments that should be organised and coordinated and there might be multiple actions to be taken as solutions through different approaches, especially with the consideration of long-term competitive advantage. Moreover, different researchers might have different solutions for solving the same problem. So, this is a complex problem.

However, due to the difficult issue we have recently encountered, the only option for the organisation is to make changes, otherwise there is no future for it and it might soon have to be closed. Also, as discussed above, developing an improved supplier status is the pre-requisite for the other two goals of developing multiple key customers and then achieving reasonable profit margins, so the improvement of the business effectiveness of the organisation can only get started from solving this problem.

1.2 Overall Objectives of the research

The transformation to an effective supplier status can help build an interdependent, equal and reliable relationship with future key customers, and sustaining this for the long term, will require adjustments in management activities and a series of actions that must be taken as soon as possible. Therefore, the overall research objectives are:

1. to determine which system-wide management activities should be re-organised for the business in future, and how; and

2. to identify what specific operational actions should be taken immediately, to achieve a more competitive supplier status that can maintain the organisation with competitive advantage in the long term.

In the context of this research, system-wide management activities refer to all management activities to be re-organized encompassing the whole firm, with all functions involved, for finally achieving a competitive supplier status; specific operational actions refer to human activities to be organized to fill the gap between the future and reality, and fuifll the desired and feasible changes.

1.3 Identifying the areas for operational improvement

As mentioned above, the primary goal that the organisation is keen to achieve immediately is to improve the current capability as a low-end supplier and move to a better status (as viewed by the customer) that can be developed with long-term competitive advantage for the long term. As found by Ulaga and Eggert's (2006), to become a competitive supplier for multiple customers, service support and personal interaction play a core role in differentiating a firm from its competitors, but that supplier know-how and its ability to improve customers' time to market do not, although they are still important differentiators. Product quality, delivery performance, acqustion costs and operation costs are moderate differentiators, and direct cost is the weakest.

As informed by the above ideas, in the context of my firm, in order to overcome views and perceptions of potential customers, all operational areas need to be considered in relation to whether they can act as differentiators. Such activities include: service support and personal interaction with customers than can differentiate us from our competitors; supplier know-how and its ability to improve customers' time to market; product quality; delivery performance; acqustion costs and operation costs.

From a quality management point of view, no professional customers would allow any candidate suppliers to become their officially certified suppliers before they have developed confidence in these candidates. Usually, before becoming an officially certified supplier, a candidate supplier must go through a pre-requisite process, including on-site audit, sample making, trial productions and small purchase orders,

to show customers that they have the robust capability to make high quality products consistently. Only after successfully going through such a process would it become feasible for a new supplier to consider how to gain more purchase orders, move up to be a main supplier, and establish a long-term relationship with the customer.

The successful realisation of this approval process implies improvement in the following aspects of operational performance: (a) developing a capability that can exactly meet customers' quality requirements, which is the "must-have" that can interest target customers and gain certified supplier status; and then (b) constructing conditions that can achieve and maintain the competitive supplier status and help the organisation to get as many more purchase orders as possible. However, as already mentioned above, any of the three strategic goals we want to achieve must directly contribute to sustainable business for our organisation. So, the problem also needs to be addressed in the context of keeping the competitive supplier status with long-term competitive advantage and helping the organisation to survive for the future.

Based upon such reasoning then questions emerge such as: Does the competitive supplier status necessarily mean a long-term competitive advantage, and can it immediately help the organisation to survive for the future? What might happen if we could not get sufficient support from other stakeholders, such as suppliers and employees? Currently, our stakeholders include local government, employees, customers, suppliers, local communities, owners and competitors. However, as agreed by the board of directors, the key stakeholders that are critically interrelated with the organisation and can immediately impact the organisation's business are customers, employees and suppliers. In addition to constructing a proper relationship with target customers, constructing proper relationships with both employees and suppliers, and getting these three relationships smoothly coordinated together, should also be addressed in the research.

As a result of the emphasis placed by the Board on certain stakeholders, I determined to approach the research problem through considering not only the interaction between the organisation and its customers, but also the interaction between the organisation and its suppliers and employees. In other words, instead of a single-stakeholder approach, a systemic approach should be adopted that addresses all the

above four areas of operational improvements: (1) satisfying target customers' quality requirements; (2) achieving competitive supplier status with target customers; (3) constructing an effective relationship with my organisation's suppliers; and (4) motivating employees for better performance

The first stage in the research project was a review of the existing research literature related to these four areas. Four simple questions were formulated to guide this literature review:

Question one: How can target customers' quality requirements be satisfied?

Question two: How can competitive supplier status be achieved with target customers?

Question three: How can an effective relationship with suppliers be established?

Question four: How can employees be motivated for better performance?

The intention was to use insights gained from the research literature in these four areas to refine the main research question for this DBA study, and to inform the action research design.

In summary, this DBA study seeks to identify and implement actions to realise my firm's strategic goal to make a change with a long-term competitive advantage from a low-end supplier to being recognised as having a high-end status. In this introductory chapter four areas of operational improvement have been identified. The next chapter presents a literature review undertaken to generate insights on operational improvement in the four areas, and to clarify how improvements will be realised within the resource constraints of my firm. In this way I seek to refine the research question for the study, and clarify the goals of the empirical (action) research. The action research methodology is then described in Chapter 3. Chapter 4 presents all the findings from the empirical work, including actions taken to improve operational performance. Chapter 5 reports the progress against research objectives. The research conclusions and implications for other (resource constrained) firms is presented in Chapter 6. The thesis finishes in Chapter 7 with reflections on my own journey as a scholar practitioner.

Chapter 2. Literature Review

This DBA study seeks to identify and implement specific actions to realise my firm's strategic goal to transform our status (as perceived by customers) to that of a "high-end supplier". Discussions at the Board had identified four areas for operational improvements (see page 16). Before engaging employees in improvement actions in each of these areas, it was prudent to review the extant research literature covering organisational performance improvment in each of the four areas. At its simplest, the purpose of this review was to learn if of any established approaches to improvement that could be applied in my firm's context. However, the expectation at the outset was that findings from the research literature would need to be adapted (in some way) to the particular situation that exist in my firm.

My literature review strategy was to identify studies relevant to small organizations and concerned with the four domains of interests identified in Chapter 1 (see page 16). All resources cited in my literature review found using the Liverpool University online library search engine. Searches were conducted using keywords taken from the four questions identified in Chapter 1 (page 16). All articles used for my literature review were seleced based upon the following criteria for selecting papers:

- The empirical context involves SMEs.
- Papers that offer relevant theoretical perspectives that help analyse how the problem might be approached.
- Papers that offer ideas based upon empirical work that may directly inform possible solutions in the context of my firm.

2.1 Purpose of the Literature Review

Chapter 1 identified the research problem, the overall objectives of the study and the four-pronged approach set by the company. This chapter will explore how the problem might be solved using existing knowledge from previous studies by reviewing related research literature, so as to understand the challenge in employing the existing knowledge in solving the problem identified by the organisation. It will identify the specific knowledge from the reviewed articles and how it will be employed to guide the establishment of four separate teams for solving the problem in four dimensions.

On the basis of this information I will argue for why an integrated team needs to be formed in the organisation integrating the four separate teams, and why I tend to approach to the research with systemic methods.

The first part of the review will consider the selected articles, followed by an analysis of how the existing knowledge from the most relevant articles could help me to solve the problem in the organisation, and finally an analysis of the challenge in integrating all the most relevant knowledge into one solution, and the main research question for my empirical work.

2.1.1 Overview of the Chapter Structure

In this literature review, the selected articles and books will be reviewed with reference to their relevance for small to medium enterprises (SMEs) and in the four domains of interest: how to satisfy customers' quality requirements; how to become a competitive supplier for target customers; how to construct an effective relationship with suppliers; and how to motivate employees for better performance. With all the articles reviewed, the approaches to solving the problem will be discussed, and the specific existing knowledge that could interest and guide me to solve the problem will be identified.

As suggested in the above section, I will examine the specific knowledge related to the four dimensions in the context of the limited resources of a small firm. I will then argue for the necessity of convening an integrated team, and discuss the implications for conducting the research with systemic methods and with action research approach. As the outcome of my literature review, the main research question will be refined.

2.2 Satisfying customers' quality requirements

In my study, satisfying customers' quality requirements means exactly transforming all of customers' technichal requirement (expressed for example in an engineering drawing) into the metal components purchased by customers. In the context of SMEs in CNC sector, any wastage or shortfall in quality can result in orders being transferred to other companies. In the following sub-sections, approaches to satisfying customers' quality requirement will be discussed, and the specific approach that suits my organization will be identified as a potential solution for my problem.

In theory, there are many approaches for enterprises to improve quality management and satisfy customers' requirements. However, in our business pratice we have found that the majority of customers require their suppliers to be certified by internationally standardized quality control systems such as ISO9000 (the quality control system established by the International Organization for Standards). Some customers require additional approaches such Total Quality Management (TQM) in which enterprices satisfy customer requirements with the involvement of all staff members), or Quality Function Deployment (QFD) in order to enhance the quality control system. In the context of my organization, certification of ISO 9000 is required by all our customers as the principle quality control system, and the addition of one of the TQM techniques is considered desirable by them. So, articles about ISO9000 and TQM were exclusively selected for these reasons.

Also, QFD is just one of the total quality management techniques that may be applied to business practice. In terms of satisfying customers quality requirements, I might have considered literate about other total quality management techniques. However, as a small company, we have to consider to introduce total management techniques that might not be expenstive to small business. QFD is one of the most popular and affordable TQM techniques adopted by all sizes of enterprises worldwide, including potential customers of my organziation, I therefore selected papers for insights they offered to SMEs contemplating the introduction of QFD.

2.2.1 Approaches to quality assurance and identification of the suitable approach for the organisation.

The ISO9000 quality system is the most common approach to product quality assurance. Many SMEs in precision machining organise machining activities as the core production process to make machined components in accordance with customers' drawings and other technical documents, and more and more SMEs in precision machining have introduced the ISO9000 quality system to adapt to international customers' requirements in terms of quality control. With the certification of ISO9000 quality system, many SMEs think that they have obtained the ability to satisfy customers' quality requirements. However, it is quite often the case that products, particularly samples made to customers' drawings, could still be

rejected by customers. The following section will discuss why customers' quality requirements might still be unsatisfied even with ISO9001 certification.

Total quality management techniques Vs. ISO9000 quality system

Prajogo and Brown (2006) analysed empirical survey data collected from SMEs and found that organisations focusing solely on the ISO9000 quality system could not produce significant quality performance, and the combination of the ISO9000 quality system and total quality management techniques makes a big difference to quality management practices and performance. However, Foley et al. (1997) found that firms certified by ISO9000 tend to think that their organisations meet the international quality management standard with total quality management techniques included, and so they seldom consider additional approaches to quality control. According to Frehr (1997), ISO9000 merely focuses on how to standardise processes related to production with very brief requirements as the guidance, and leaves organisations to establish specific processes and employ quality control techniques themselves; in contrast, total quality management techniques are based on ISO9000 and concern the organisation as a whole for collective and continuous improvements and quality performance, with requirements in detail.

This explains why SMEs still cannot effectively satisfy customers' quality requirements with the certification of the single ISO9000, and that total quality management techniques must be introduced as an additional and joint approach.

Quality function deployment (QFD) as a technique within total quality management

Fully implementing total quality management methods might be time consuming and expensive, so Ghobadian and Gallear (1997) suggested that SMEs might need to approach the implementation of the total quality management system differently from large organisations due to their naturally different business characteristics. It is not only unaffordable but also unnecessary for SMEs to introduce total quality management methods as fully or exactly as large organisations, and SMEs have their own advantages for implementing total quality management methods in terms of building cross-functional integration, effective leadership and suitable communication methods, with their less numerous management layers and more efficient

empowering than large organisations. As long as the specific total quality management methods have been identified as the suitable techniques and successfully implemented, SMEs can achieve the same level of quality performance as large organisations.

In their study of data collected from 977 firms in the major industrialised regions of the world, Everett et al. (1997) suggest that customers' product specifications never remain static and readily achievable; instead, they are dynamic and keep changing. They also suggest that a firm's approach to quality improvement correlates to actual product quality, and a firm's quality performance can be affected by the extent to which customer expectation is focused on and understood. So, it is extremely important that customer expectation can be constantly reviewed and correctly translated into local production specifications through customer-driven quality improvement techniques within total quality management.

Crowe and Chao-Chun (1996) found that the well-known quality function deployment (QFD) is widely used as a powerful technique within total quality management for precisely transferring customer requirements into engineering specifications, and Zairi and Youssef (1995) found that QFD is a main pillar for successful total quality management, which is demonstrated in the original definition by Akao (1994):

> 'Quality function deployment is a method to transform qualitative user demands into quantitative parameters, to deploy the functions forming quality, and to deploy methods for achieving the design quality into subsystems and component parts, and ultimately to specific elements of the manufacturing process' (Akao, 1994, p.339).

QFD as the suitable approach for my organisation

In my organisation, usually two types of technical information are received from customers: with drawings in most cases and prototypes occasionally. These are the technical requirements, including quantitative technical information such as the dimensions of products, and qualitative technical information such as the raw materials to be used. Usually, quantitative requirements are definite and, in most cases, can be correctly understood and achieved without even translating them into the local working language; in contrast, qualitative requirements are not as definite and, in most cases, must be translated for production. It is in the process of translation

that misunderstandings of customers' qualitative requirements occur. So, a customer-driven approach to exactly translating customers' qualitative requirements into production is desirable for the organisation, and such an approach needs QFD as the joint approach in the existing ISO9000 system to satisfy customer quality requirements.

QFD has been developed over decades and has become an overall concept providing solutions for translating customer requirements into appropriate local technical requirements for each production stage, including marketing strategy development, product planning development, design and engineering management, production process management and sales management (Sullivan, 1986), with various approaches in different industries which make it challenging for organisations to find suitable approaches to QFD within the constraints of time and cost that might cause QFD failure (Erginel, 2010).

2.2.2 Approaches to the application of QFD and identification of the most suitable one for the organisation.

Since the origin of the concept, QFD has been developed through many approaches for different production stages in different industries, which is reflected in the study by Lai-Kow and Ming-Lu (2002). They found and reviewed about 650 QFD publications to determine how QFD has evolved and rapidly spread all over the world across industries since it was initially developed in Japan in the late 1960s. They found that, although QFD was originally developed to improve design process for new products in the shipbuilding and electronics sectors so that high quality manufacturing of the new products could be organised from the beginning, its rapid development has resulted in its applications not only in manufacturing industries but also in the service sector and it is impossible now to find an industry that QFD has not been applied to. To help researchers and practitioners to explore and apply QFD further, the authors categorised the various approaches to the application of QFD into nine functional fields:

1. **Product development**. In this field, QDF is not only used for new product development in manufacturing industries, but also applied to service industries for new service development, such as developing courses and curriculums (Bier and Cornesky, 2001). It can even be

applied to developing model-change products (Hoque et al., 2000), reliability test methods (Kwon and Han, 1999), software (Haag et al., 1996) and strategic performance metrics and systems (Hauser, 2001) which are closely related to the new products or services.

2. **Quality management system**. In this field, QFD is used as an essential quality assurance tool for achieving successful product development. Its application includes expert systems for quality management (Bird, 1992), process improvement (Richardson, 2001), quality control (Prasad, 1997), quality information systems (Lin and Fite, 1995), quality systems (Kanji, 1998), service improvement (Barnes and Vidgen, 2001), service quality management systems (Chang and Lin, 1991) and the improvement of software process.

3. **Customer needs analysis**. This is always the first step of any QFD process, and the basis for successful product development and quality management. In this particular field, its application mainly focuses on collecting data, translating customer needs and satisfying customer needs. It can be applied to customer involvement (Kaulio, 1998), customer responsiveness (Atkinson, 1990), customer services (Graessel and Zeidler, 1993), definition of quality requirements (Hauser and Klein, 1988), processing client requirements (Kamara and Anumba, 2000) and prioritising customer needs (Persson et al., 2000).

4. **Product design**. Traditionally, organisations rely on inspections for quality control, and significant dedicated organisational resources have to be involved in the very late stages for inspecting and testing. If QFD is applied to the product design process, quality can be designed into products through analysing customer needs to avoid the overuse of resources in the late stages of production for inspecting and testing. Specifically, QFD can be applied to design for manufacturability (Youssef, 1994), designing customer-driven marketing programmes (Mohr-Jackson, 1996), manufacturing system design (Monplaisir et al., 1997), product definition (Aldrich and Stauffer, 1995), product/process innovation (Presley et al., 2000), product and service introduction (Nolle, 1993) and service design (Selen and Schepers, 2001).

5. **Planning**. In this field, QFD is used as a pro-active customer-driven planning process to identify and solve problems as early as possible, so that fewer human resources are involved for improvements later. Here, the idea of QFD can be applied to not only the usual product planning and process planning, but also general, strategic and other types of planning such as business planning (Ferrell and Ferrell, 1994), organisation planning (King, 1992), service quality planning (Stuart and Stephen, 1996), strategic research planning (Chen and Bullington, 1993), supply chain planning (Li et al., 2001) and technical planning (McLaughlin and Stratman, 1997).

6. **Engineering**. In the engineering field, QFD can be used to improve the

engineering process. In particular, it can be applied to concurrent engineering (Zakarian and Kusiak, 1999), quality engineering (Charteris, 1993), rehabilitation engineering (Jacques et al., 1994), requirements engineering (Johansson and Timpka, 1996), simultaneous engineering (Schmidt, 1997), system engineering (Brady, 2001) and value engineering (Brown, 1991).

7. **Decision-making**. for each organisation, it is important that products can be designed to satisfy customer or market needs, and QFD can help organisations to identify those needs for correct decision-making over product design specifications. It can be applied to determining methods of measuring customer satisfaction (Motwani et al., 1996), productivity of technology (Chiou et al., 1999), design alternatives (Cook and Wu, 2001), improvement priorities (Barad and Gien, 2001), marketing strategies (Nagendra and Osborne, 2000), service delivery priorities (Curry, 1999) and product options (Otto, 1995).

8. **Management**. In this field, QFD can be used to improve management systems and help organisations to continuously adapt to the effects from customers and markets, so that products can be made to meet customer or market needs. In particular, QFD can be applied to management of business processes (Rajala et al., 1997), management of customer complaints (Lapidus and Schibrowsky, 1994), management of research portfolios (Kauffmann et al., 1999), management of services (Partovi, 2001) and management of technologies (Hequet, 1991).

9. ***Teamwork with consideration of timing, costing and others***. In this field, using the QFD process, teamwork, timing and cost can be improved with the early collective involvement of stakeholders in collectively analysing and translating customer needs into local requirements and instructions, so that high quality can be designed into the production process and products can be correctly made on time and as planned with as less corrective action. The idea of QFD can be applied to shortening design cycles and lowering start-up costs (Abdul-Rahman et al., 1999), cross-functional cooperation (Song et al., 1997), information sharing and internal communications (Harding et al., 1999), management of just-in-time logistics (Natarajan and Weinrauch, 1990), problem prevention (Stauss, 1993), resource allocation (Colton and Staples, 1997) and management of target costing (Lopez-Gonzalez, 2001) through encouraging teamwork and cooperation between different business units.

In my research project, all the above nine approaches to the application of QFD seem relevant more or less to the context of my organization. However, given our size it is not realistic to apply all these approaches to my organization at the same time, so in the next sub-section I explain the reasons for selecting one approach.

The most suitable approach to the application of QFD for the organisation

Lai-Kow, and Ming-Lu (2002) clarified in their study that it might be difficult to find the absolute boundaries between these functional fields, as the idea of QFD is applied to business practices. In the organisation, we do not design new products for customers; rather, we make products through regular CNC machining processes to design drawings from customers. Thus we do not have to go through the processes related to the creation of new products, such as product development, product design or decision making. Accordingly, it would be very rare that these functional fields would play a role that affects the situation of the problem, and thus it is unnecessary to pay attention to them here.

In my organisation, customer needs are usually translated into the local work language and technical requirements through a bureaucratic procedure, and it is for the chief engineer to decide using his experience and expertise how customer products should be made through programming the existing CNC machines, without the early involvement of other functional resources. With such a procedure, it is difficult for the organisation to approach quality management, customer needs analysis, planning, engineering and management effectively with considerations of timing and cost at the very early stages of production, but these things are important for business effectiveness and would be better addressed as early as possible through an integrated approach. According to Barad and Gien (2001), human activities such as autonomous control of work quality and quality improvement teams play an important role in quality improvement for small manufacturing enterprises.

So, having been compared all the other functional fields, the teamwork functional field is identified as the most suitable approach to QFD for the organisation.

2.2.3   QFD applied to teamwork

According to Ozgener (2003), the primary function of QFD is to identify the critical issues and parameters of products which reflect customers' priorities and expected values, so QFD is actually a multidisciplinary technique for not only identifying customers' definite requirements but also indefinite values which sometimes are not clearly expressed by customers. In the various QFD processes, the most common

process is the quality process, originally called the 'House of Quality', which should be built and supported by a cross-functional QFD team. With empowerment by top management and under the guidance of a trained facilitator, this QFD team is formed with multidisciplinary team members from all functional departments which are immediately related to products and their production. So, with such a cross-functional team, customer needs can be analysed thoroughly and correctly translated by multidisciplinary team members with the involvement of customers when needed, and all potential issues can be addressed in the very early production stage to avoid unnecessary corrective activities and re-production later.

The idea of the QFD team is reflected in the empirical study by Griffin and Hauser (1992). They compared two different teams in a company in the automobile industry, both reporting to the same manager and developing the same number of components with comparable technical complexity. One team organised their work according to traditional phase review procedure as required by the existing management system, the other organised adopted QFD principles. It was found that the phase-review team had much more vertical communication than the QFD team through management, which decreased the effectiveness of coordinating multidisciplinary resources from different functional departments and potentially affected the progress of product development. By contrast, the QFD team had much more horizontal and direct communication between team members without management, which effectively coordinated the multidisciplinary resources needed for exactly translating customer needs into the products. Although the QFD team tended to have much more inward communication between team members, they also had many more topics than the phase-review team for external resources, such as customer needs and market information, which might explain why the QFD technique has the potential to exactly translate customer requirements and effectively prevent problems at the very early production stage.

2.2.4 Knowledge identified for guiding me to solve the quality assurance problem

Usually after we receive new design drawings from customers, the organisation's sales representatives translate the qualitative technical requirements on the drawings into Chinese, and then forward them to the chief engineer to decide if we can make the

products and how to make them, and what the lead time and costs would be. The chief engineer usually makes his decisions on the basis of his experience and expertise and the translation by the Business Representatives. Although the chief engineer occasionally organises meetings involving different functional engineers and other people, such meetings are mainly for collecting information that he needs for making his own decisions, and how the products would be quality-controlled is only determined by him and allocated to different functional units later through the management system.

In the organisation, the current mechanism for introducing new product drawings into the production process is problematic. Firstly, quite often the translation may not accurately reflect customer needs. Secondly, the chief engineer sometimes over-estimates customer needs without being challenged by other engineers and people from different functional units, and therefore much more time and cost are needed for each product than is expected by customers. Finally, without official clarification of customer needs and potential technical difficulties that may occur in the production process, serious problems are only found in the very late stage of production or even after the completion of production, which directly causes either customer dissatisfaction or loss.

According to Ozgener (2003) and Griffin and Hauser (1992), the teamwork approach to QFD helps translate customer needs effectively and prevents quality issues through improving communication between different functional departments. To satisfy customer quality requirements, the organisation's customer's needs should also be analysed and translated collectively by a group of people from different functional departments with different disciplinary backgrounds. Ideas about forming a cross-functional QFD team for improving communication between different functional departments could guide me to the solution for satisfying customer quality requirements in future.

2.3   Becoming a competitive supplier for target customers

In my study, becoming a competitive supplier for target customers means how to develop a competitive advantage that target customers would perceive and rely upon.

In the context of Chinese Engineering SMEs this represents a significant challenge because of the large number of such companies. In such circumstances my firm is seeking to differentiate itself through an enhanced relaiability. In the following sub-sections, approaches to becoming a competitive suppliers for stage customers will be discussed, and the specific approach that suits my organization will be identified as theoretical solution for my problem.

2.3.1   Low price as the common approach to competitiveness

According to Gržinić and Zanketić (2008), attraction in business relationships improves competitive advantage. In the international markets of machined components, to make themselves competitive, many small to medium firms choose to attract potential customers through competing on price while maintaining high quality. They expect that this approach will allow them to not only secure big purchase orders, but establish long-term loyalty from customers. Without doubt, cost reduction is an important benefit for the customer in a commercial exchange (Cannon and Homburg, 2001), and buyers who only look for cheap products in the international markets are most likely sensitive to price. However, low price does not always attract customers as effectively as expected, and what could be achieved in practice may be only small and irregular orders, trial orders or even only the initial factory audit without any further progress towards building the desired effective buyer-supplier relationship.

According to Håkansson and Snehota (1989) and to Wilkinson et al. (2005), to survive in the market, every firm depends on other firms to maintain their competitive strength, and therefore business relationship with other firms are extremely important. According to Mortensen (2012), the business relationship is built on the basis of attraction between the parties, which is viewed as what and how many voluntary actions could be taken by each party in the relationship. From a customer point of view, perceived supplier attraction is about the extent to which voluntary actions could be taken for customers by suppliers in the course of initiation and development of buyer-supplier relationship, so that customers' competitive strength could be maintained in their market.

Mortensen (2012) found that, in the buyer-supplier relationship, the possible supplier

attraction perceived by customers has six perspectives as follows:

A. According to Dwyer et al. (1987), the attraction in a business relationship is a developing mechanism that helps the parties to establish mutual trust and satisfaction, which leads to mutual commitment. In the buyer-supplier relationship, the attraction is viewed as the degree to which the buyer and the supplier could achieve reward-cost outcome in their interaction, not only economic but also social. In the course of developing new, additional or alternative suppliers, customers might perceive supplier attraction from: (a) the extent to which they could achieve trust and satisfaction with target suppliers; (b) the extent to which mutual commitments would be made with target suppliers; and (c) the economic and social reward-cost outcome.

B. Halinen (1997) argues that the attraction in a business relationship is a future-oriented relational bond that incorporates conscious and unconscious expectations of every party in the business relationship, and keeps all parties together in the business relationship. In the buyer-supplier relationship, the attraction plays a role as a future-oriented relational bond that incorporates both suppliers' and buyers' conscious and unconscious expectations, and keeps suppliers and buyers together in the relationship. In the course of developing new, additional or alternative suppliers, customers might perceive attraction from how target suppliers could voluntarily satisfy their expectations and stay with them in the future.

C. According to Harris et al. (2003), attraction in a business relationship is important in the whole course of its initiation, development and maintenance, and incorporates past, current and future economic, resource-based and social rewards, leading to the emergence of cooperation, trust and commitment between the parties. In the buyer-supplier relationship, the attraction presents both buyers' and suppliers' ability to provide past, current and future economic, resource-based and social rewards. In the course of developing new, additional or alternative suppliers, customers might perceive supplier attraction from the target suppliers' ability to provide economic, resource-based and social benefits, incorporating past, current and future.

D. Hald et al. (2009) argues that attraction in a business relationship is a function of three elements: perceived value of being associated with other parties, perceived trust in other parties and perceived dependence on other parties. In the buyer-supplier relationship, attraction is the force fostering voluntarism between buyers and suppliers in the exchange of purchasing and marketing offerings, and then building mutually beneficial relationships through further pushing the parties closer together. In the course of developing new, additional or alternative suppliers, the customer might perceive supplier attraction from: (a) the value associated with the target suppliers; (b) trust from the target suppliers; and (c) how they could depend on the target suppliers.

E. For Wilkinson et al. (2005), the attraction, with expected value at the core, is the initial sparkle at the start of business relationship and is most likely perceived by individuals who share similar professional and ethical backgrounds. In the buyer-supplier relationship, attraction is an individual concept (Mortensen et al., 2008) and only perceived by individuals from both parties who have the similar professional and ethical background, understand created value and can put it into their own business context, and believe the expected value can be delivered by the other party. In the course of developing new, additional or alternative suppliers, customers might perceive supplier attraction from whether the individuals from the target suppliers share a similar professional and ethical background and can deliver expected value, which should also be understood by the individuals from the target suppliers.

F. According to Ellegaard and Ritter (2007), attraction in a buyer-supplier relationship is a mutual construct that presents the degree of mutual interest of the actors, and this perceived attraction is determined by value creation, interaction and emotion with interpersonal activities (Moon and Bonney, 2007).

Drawing on each of these perspectives, low prices offered by suppliers might be perceived by customers as an economic benefit, but might not be attractive enough; instead, to make customers sufficiently attracted and interested in constructing the relationship, other factors such as benefits should be considered. This might explain why, for SMEs, the low-price strategy quite often does not play its role as effectively

as expected, particularly in the development of new customers.

However, to develop supplier attraction thoroughly using all these perspectives might be too complex to be feasible, especially for SMEs and so the following section discuss how a firm can develop attraction in business practice through a streamlined approach.

2.3.2 Developing business practice through a streamlined approach

In my study, a streamlined approach means an approach that could integrate and harmonise different perspectives about how to attract customers that can be implemented within my organization and solves my problem.

In practice, SMEs may struggle to develop attractions to customers through using all six of these perspectives by Mortensen (2012) (see section 2.3.1) due to lack of time and resources and the expense involved. A streamlined approach that could integrate and harmonise these perspectives is desirable for SMEs.

Although the six perspectives are defined differently and the statement of each is expressed in different form, they all concern the possible benefits and costs as the core of attraction in business relationships, which are viewed as the two fundamental dimensions of customer value creation (Ulaga and Eggert, 2006; Payne and Holt, 2001). According to Slater (1997) and Woodruff (1997), creating superior customer value is the key for a firm to achieve survival and success for the long-term in the business environment, and a firm should regard customer value as the cornerstone of marketing management (Anderson and Naru, 2004, cited in Ulaga and Eggert, 2006, p.120). Therefore, as a specific approach, customer value creation contributes to supplier attraction and the approach to creating customer value in business practice contributes to the development and improvement of supplier attraction.

For the organisation, as a small firm, we have limited resources and almost every staff member is multi-functional, so it is not feasible to take a complex and indefinite perspective on how to develop supplier attraction; instead, an effective approach which is not only specific but affordable is needed.

We do not design products for the market at all; instead, we organise production and make products to customers' design drawings. When customers send us their

drawings, they might also send the same drawing to our competitors to compare the benefits and costs of offers from different suppliers. Although customers sometimes get us involved in their early product development to ensure that all machined sections of the design can be achieved through existing machining techniques and the most economic proposals can be made by the organisation with our knowhow in terms of machining, in most cases design drawings from customers are frozen on the final issue level and we can use them only for organising productions. With such a business nature, it is impossible for the organisation to differentiate itself from its competitors through designing distinct products for customers, and it is easy for customers to perceive the difference between ours offers and those from our competitors through just measuring the benefits and costs of the whole package. An approach by which we might improve the whole package of our offer in terms of customer benefits and costs in commercial exchange is crucial.

With these factors indicate that an approach to comprehensively considering both customer benefits and costs in the commercial exchange might help develop supplier attraction for the organisation, and customer value creation that sees benefits and costs as the two fundamental dimensions could be the best approach.

However, as has been seen in many previous studies, customer value creation has become a general concept and there are various perspectives about how to create customer value in business practice (Paananen and Seppänen, 2013). Lähteenmäki and Nätti (2013) found that, due to barriers such as the long-term habit of doing business in a producer-oriented way and lack of employee commitment, the application of customer value creation might encounter difficulty and might even lead to failure. It is also challenging for a firm to effectively approach creating value for customers, and it is important to determine how customer value could be effectively developed and managed in business practice as the precondition of successful application creation.

2.3.3 Developing and managing customer value in the organisation

Customer value creation is a broad approach, and there are various perspectives on how to approach creating customer value. Previous studies of customer value have

found that it relies on the idea of costs versus benefits (Payne and Holt, 2001), which might be perceived pre-consciously, consciously or even subconsciously by customers (Gorth and Dye, 1999). Customers might perceive value in different ways and each might have their own value model for their particular needs and desires (Ravald and Grönroos, 1996). Only after the business transaction has taken place might it be confirmed that customers might have perceived enough value (Paananen and Seppänen, 2013). Therefore, development and management of customer value is rather challenging.

Paananen and Seppänen (2013) found that there are four ways to encourage customer value development and management: (1) understanding the customer benefits and set customer benefits as goals (Holbrook, 2005); (2) managing relationship values (Payne and Holt, 2001); (3) managing relational drivers with customers and the link between customer long-term and shareholder value (Palmatier, 2008; Stahl et al., 2003); and (4) managing customer-perceived value and value that might be superior for customers (Ulaga and Chacour, 2001; Slater and Narver, 2000).

My organisation is keen to build a long-term supplier-buyer relationship with desired customers and become a competitive supplier for them, so we must be able to show customers what distinct and perceived relationship value they can expect in future from building up such a relationship, and how the organisation would be able to manage the expected relationship value for them in future. Relationship value management (Payne and Holt, 2001) should be a suitable way for customer value development and management for the organisation, and empirical studies concerning customer value creation on the basis of relationship value management might contribute knowledge that could guide me to solve the problem.

Customer value creation on the basis of relationship value
Ulaga and Eggert (2006) found that more and more customers are consolidating their supply bases with key suppliers and backup suppliers, so suppliers are facing the alternative of either becoming key suppliers or playing the role of backup suppliers. To gain key supplier status, firms must try to differentiate themselves from competitors in the buyer-supplier relationship.

The authors explored how a firm could differentiate itself from its competitors and gain the key supplier status through creating customer value on the basis of relationship value management. They developed a 2x3 matrix with customer benefits and customer costs as the two fundamental dimensions of customer value creation; and core offering, sourcing process and customer operations as the source of customer value creation.

A qualitative study was designed to explore drivers of customer value creation, and a quantitative study to explore the sequence of different roles that the customer value creation drivers might play in terms of differentiating a firm from its competitors. The findings are categorised into two groups.

In the qualitative study, it was found that customer values could be created by nine drivers: product quality, delivery performance, direct costs, service support, interpersonal interaction, customer acquisition costs, supplier know-how, customers' time to market and customer operations costs.

In the quantitative study, it was found within the nine customer value creation drivers that service support and personal interaction play a core role to differentiate a firm from its competitors, but that supplier know-how and its ability to improve customers' time to market do not, although they are still important differentiators. Product quality, delivery performance, acquisition costs and operation costs are moderate differentiators, and direct cost is the weakest.

Drawing on Ulaga and Eggert's (2006) findings, to become a competitive supplier for multiple customers, the organisation should try to gain key supplier status with all customers. To achieve such a goal, in addition to all the must-haves as required by customers and the organisation's know-how and expertise that can improve customers' time to market, a mechanism of raising service support and personal interaction with customers should be established.

2.4 Building an effective relationship with suppliers

In my study, building an effective relationship with suppliers means how to develop a business relations that could keep strategic suppliers cooperative. In the context of SMEs large suppliers have considerable power that can be manifest in prices and and

not being a preferred customer in case of stock shortages. In the following sub-sections of this section, approaches to building effective relationship with suppliers will be discussed, and the specific approach that suits my organization will be identified as theoretical solution for my problem.

2.4.1 Traditional approaches to managing supplier relationships

In the CNC machining industry, products are made in accordance with the customer's drawings. Typically, after purchase orders have been received from customers, firms need to order raw materials from suppliers immediately so that production can start as soon as possible to achieve the delivery time demanded by the customer. If requirements are big enough to interest metal material mills, machining firms may develop metal material mills as suppliers and order customised materials from them directly. If they are small and metal materials mills are not interested, machining firms then have to develop distributors as suppliers and order standard metal materials from them. To build a reliable business relationship with suppliers and continuously improve supplier performance, like many machining firms I firm has introduced supplier management techniques, such as just-in-time logistics, supply chain management and supplier selection management (Ramsay, 1994), and hope these management techniques may effectively improve supplier performance. However, as also found by Ramsay (1994) these techniques may not work and expected, especially for SMEs. Instead, some machining firms such as my firm find that these commonly applied management techniques just cannot help them to build a reliable business relationship with their suppliers, and some important suppliers do not care about their requirements or difficulties in terms of delivery time. The following section will discuss existing research into how firms could approach developing an effective business relationship with suppliers.

Customer attraction and developing effective supplier relationships

According to Mortensen and Arlbjørn (2012), customer attraction is an inter-organisational approach taking suppliers' interests and motivations into consideration. According to Mortensen (2012), suppliers need to develop supplier attraction as they build business relationship with customers, and customers also need to develop customer attraction as they build business relationship with suppliers so that capable

suppliers are motivated and attracted. From the supplier's point of view, perceived customer attraction is generally about to what extent voluntary actions could be taken by customers for suppliers in the course of initiation and development of the supplier relationship. Firms may develop customer attraction as they build supplier relationship from four aspects as following:

A. According to Ramsay and Wagner (2009), in the course of developing an effective business relationship with suppliers, instead of hard hitting negotiation and threats, firms may try to influence and motivate supplier behaviour that matches their future preferences *through understanding and recognising the suppliers' needs, wants and preferences.* In order to ensure that supplier behaviours match the firms' preferences, instead of only using customer power to reach agreements with suppliers, firms such as my organization should enhance the understanding and recognition of suppliers' needs, wants and preferences and consider what should be voluntarily done for suppliers.

B. Schiele and Krummaker (2011) argue that, to motivate and attract suppliers, *firms should try to be perceived as preferred customers* which may lead to supplier satisfaction over time, because preferred customers are usually treated well by suppliers. According to Schiele (2012), it is very important for firms to understand whether they are preferred customers to their suppliers and assess whether they are attractive enough in the supplier relationship. On the basis of this research, firms such as my organization should seriously consider: (a) whether they are able to satisfy suppliers' needs, wants and preferences; (b) whether they are perceived as preferred customers by suppliers; (c) if they are not perceived as preferred customers, what they can offer differently from other buying organisations to suppliers; and (d) how they could contribute significantly to suppliers' business in future.

C. Hald (2010, cited in Mortensen, 2012, p.1213) believes that *perception of customer attraction is not only affected by its functional area, but also as individuals, and this individual element usually makes the exploration of customer attraction more complex.* Individual relationships between buying organisations such as my organization and supplying organisations should be seen as a required

element in the business partnership.

D. Mortensen et al. (2008) argue that, as smaller firms develop supplier relationship with larger suppliers, to make themselves attractive to suppliers *they should consider all economic, resource and social factors as key determinants so that customer attraction may be increased*. As informed, particularly for small businesses such as my organization, the social factor between individuals from buying organisations and supplying organisations should be seriously valued.

In summary, to develop an effective business relationship with suppliers, firms may develop customer attraction from four perspectives: (a) enhancing the understanding and recognition of suppliers' needs, wants and preferences; (b) being perceived as preferred customers; (c) enhancing individual relationship within the framework of business relationship; or (d) instead of commercial factors, enhancing social factors that could help form and improve personal relationship between individuals from different organisations.

Traditional approaches vs the customer attraction approach to the management of the supplier relationship

Ellegaard et al. (2003) argue that, in contrast to the traditional supplier management approaches preferred by many buyers, customer attraction may be regarded as an alternative approach when supplier motivation, commitment and trust are critically related to supplier performance. In business practice, if supplier motivation, commitment and trust are critical, firms need to seriously consider: (a) what the suppliers' interests and motivation are; (b) whether the traditional supplier management approaches suit their business contexts; and (c) whether customer attraction could be the alternative and more effective approach.

Ramsay (1994) argues that many of the traditional supplier management tools or techniques, such as just-in-time management, supplier selection management and supplier performance management, were developed for large and powerful organisations, and it has been shown that when applied to SMEs, these management tools and techniques may not help them effectively manage their purchasing relationship with their suppliers. Mudambi et al. (2004) concluded that large organisations tend to develop a power-based relationship with their suppliers due to

their large business size and high-volume purchase orders which gives large organisations a powerful and dominant position when dealing with suppliers. In contrast, due to the disadvantage of small size and low-volume orders, SMEs are not able to dominate the purchasing relationship when dealing with their suppliers. With these ideas, this explains why traditional techniques for supplier management sometimes do not work for SMEs.

Customer attraction as an alternative approach for the firm

My firm is a small CNC machining factory, and needs to order materials from suppliers immediately after an order is placed. Most orders are small and metal materials mills are not interested, so the firm has to develop metal material distributors as suppliers and can only order standard metal materials from them. Due to its size it does not have the power to dominate business relationships, and we need to convince suppliers of our motivation, commitment and trustworthiness so that materials can be obtained in time. Following Ellegaard et al. (2003), customer attraction should be focused on and developed by the firm as the alternative approach to traditional approaches, for constructing an effective business relationship with suppliers. All four of the different perspectives identified above might suit the context of the firm, which might be too broad an approach, therefore a specific approach must be identified to help simplify the implementation of our customer attraction technique.

Development of customer attraction

With enough business resources to offer suppliers, large firms may construct a power-based relationship to dominate suppliers and make them compliant with the adoption of customer requirements; SMEs are not in that position (Hald, 2010, cited in Mortensen, 2012, p.1213), and the social factor becomes as important as economic and resource factors to increase small firms' customer attraction (Mortensen et al., 2008). According to Zheng et al. (2003), when there is the lack of power, trust takes the social role for SMEs to construct inter-firm relationship with suppliers, which could help develop the firm's attractiveness and meet suppliers' long-term expectations and finally help the firm become a preferred customer. As the alternative relationship to power-based supplier relationship, management of trust in the business relationship with suppliers might be the best approach for the firm to implementing customer

attraction techniques.

The arguments from previous studies concerning trust in business relationships are reflected in the study by Morrissey and Pittaway (2006). In this empirical study, the authors explored how SMEs should develop a proper purchasing relationship with their suppliers, due to: (a) previous studies being developed for large organisations, and not being effective for SMEs; and (b) the disadvantage of small business size and the inability to construct a power-based business relationship and dominate the relationship when dealing with their suppliers.

Morrissey and Pittaway (2006) conducted a pilot survey and two live surveys to explore what business relationship should be constructed by SMEs with their suppliers and what factors should be considered for constructing such a business relationship. They found that, with the lack of power, management of trust in the direct commercial relationship with suppliers is a critical competence for successful SMEs. They also concluded that to achieve trust in direct commercial relationship with suppliers, social factors such as long-term agreements, openness, honesty, words backed by actions, on-time payment and being kept informed should be considered as the key constructs of such a trust-based relationship.

2.4.2 Knowledge identified for guiding me to solve supplier relationship problems

For my firm, suppliers of the organisation are key stakeholders, but we do not have the power to dominate the relationship with them. As a result, we are quite often at a disadvantage when dealing with suppliers and have to make compromises again and again to persuade them to confirm purchase orders and make deliveries in time. Although many traditional supplier management techniques have been introduced to the firm, suppliers are not as cooperative and supportive we would like, and so actions must be taken to construct an effective relationship.

According to Morrissey and Pittaway (2006), the problem may be solved through managing trust in the business relationship with suppliers, and that trust should be developed through enhancing social factors such as long-term agreements, openness, honesty, words backed by actions, on-time payment and being kept informed. However, as argued by Sako and Helper (1998), the trust of SMEs might be abused by

their suppliers if such behaviour does not have an attitudinal fit with their suppliers. So, to manage trust in the in-business relationship with right suppliers effectively, it also necessary to consider how to avoid suppliers that might potentially abuse the firm trust.

2.5 Motivating employees for better performance

In my study, motivating employees for better performance means how to improve employees performance through motivating them. In the context of Chinese SMEs it is not uncommen for employees to switch firms for very small advantages. Such employee turnover risk loosing valuable knowledge and incurring costs of training new hires. In the following sub-section, approaches to motivating employees will be discussed, and the specific approach that suits my organization will be identified as theoretical solution for my problem.

Like many of other business in the CNC machining industry In China, the firm is a private SME. Usually skilled CNC machining employees just perform to what they are paid for and do not like to sign long term employment contracts so that they may move to new employers at any time they like. Losing CNC machining employees is already the norm for the firm and recruiting new employees is typically the first priority for the firm to do immediately after the Chinese New Year holidays, because many employees just do not come back. To make employees happy and reduce the loss rate, like many of other business, the firm has to offer employees food and drink, accommodation on request and even flight tickets to travel home during public holidays, all free of charge. However, in most cases, the state of the employee-employer relationship just continues with no significant change.

Employee motivation

According to Moran et al. (2012), highly motivated employees contribute high performance, because they are responsive to the goals and objectives towards which they are expected to make efforts. According to Kalimullah et al. (2010), it is essential to encourage employee motivation because highly motivated employees are more likely to constantly look for improved practices at work, which leads to a successful business. Employee motivation is the subject of a huge and complex literature, and

this review will focus on how employee motivation might be affected by various factors in business practices and how employee performance might be improved through increasing employee motivation.

As argued by Rynes et al. (2004), no employees want to work for free; instead, all employees must be paid with the right salary, which is the most fundamental factor to motivate employees towards higher performance and greater productivity. In business practice, although many employers might claim that they have paid their employees as much as other organisations and employees are expected to perform to what they are paid for, actually it still remains important for employers to ask themselves that whether they have paid their employees reasonably in their own business contexts, especially if they are not happy with their employees' performance.

According to Ali and Ahmad (2009) and to Khan (2010), employee performance is directly influenced by employee satisfaction which is the result of rewards including pay, bonuses, promotion and other types of rewards that may motivate employees towards higher performance at work. Accordingly, all business organisations should use rewards as motivators to improve employee performance, and if employers are not happy with their employees' performance, they might need to consider whether they are aware of their employees' expectations of rewards and whether they have offered enough of the right rewards to their employees.

Yazdani et al. (2011) argue that empowerment helps organisations to construct an ideal work environment where employees have a strong sense of belonging and pride in the win-win relationship with their employers. To understand the importance of their personal life closely connected with their work life, and empowerment helps employees to obtain the strong sense of responsibility with which they cooperate with others and make constant progress on routine operations, leading to the continuous improvements of business effectiveness of their organisations. In business practice, if employers are not happy with their employees' performance, they might need to ask themselves whether they have empowered their employees enough so that employees may be motivated to obtain the strong sense of belonging, pride and responsibility, leading to the desired employee performance and business effectiveness.

According to Annamalai (2010), as the interpersonal effect and influence on relations, trust plays an important role to help organisations improve and be successful through motivating employees to obtain the trust in the relations with both colleagues and their organisations. In business practice, if employers are not happy with their employees' performance, they might need to consider whether the trust has been developed and existing throughout their organisations.

Abadi et al. (2011) argue that high productivity depends on the effectiveness of the workforce, which in turn depends on how employees are trained, so training also has an important role in improving employee motivation. In business practice, one might need to consider whether staff training is carried out sufficiently and frequently as it should be if employers are not happy with productivity.

In light of these studies, there is a clear case for seeking to motivate employees towards sustainably improved performance that contributes to achieving organizational goals and objectives.

Increasing employee motivation in business practice

As discussed in the above section, employee performance might be improved through increasing employee motivation with consideration of salary, rewards, a strong sense of belonging with empowerment, pride and responsibility, trust or training. Manzoor (2012) explored the impact of employee motivation on employee performance and business effectiveness, and determined the factors that increase employee motivation and examined the relationship between employee motivation and business effectiveness based on the data collected in other empirical studies. He found that high employee motivation increases performance and business effectiveness, and employee motivation is directly increased by empowerment in the process of decision making and problem solving and organisational recognition of achievement, implying that empowerment in the process of decision making and problem solving and recognition on employees' fulfilment of tasks and contributions lead to a work environment which encourages employees to make improvements constantly and contributions willingly.

My firm is a small factory with only 40 employees. Although all employees are paid

above average salary for the industry and offered more benefits than many competitors, employees are still not as active enough as expected by the firm, and important employees may still quit their jobs at any time which has been worrying the top management. What has been offered to these employees may not be significantly different from our competitors, and it seems to me that it has never been seriously considered what, in addition to current offerings, employees might expect from the firm and how they should be motivated to stay with the firm longer and contribute more.

So, in relation to the performance improvement objectives in this project, there is a clear case for greater involvement of employees. I therefore think that employee motivation should be adopted as an approach to improving employee performance in the firm.

According to Manzoor (2012), the problem could be solved through changing the current work environment and encouraging employees to make constant improvements and contributions by empowering them in the process of making decisions and solving problems and recognising their fulfilment of contracted tasks with extra contributions such as with rewards, bonuses and promotion. Such a change should be immediately implemented, involving as many employees as possible in solving the problem of this thesis project.

2.6 Applying the existing knowledge to solve the problem

In this section, how to apply the existing knokwlege identified from the literature review will be discussed in the following sub-sections towards the four researched areas, leading to the research question refined for my action research.

2.6.1 How customers' quality requirements can be satisfied by the firm

The idea of forming a cross-functional QFD team for improving communication between different functional departments could guide me to the solution for satisfying customer quality requirements. I could help the organisation form a QFD team with representatives from all functional departments involved in the production process to replace the existing bureaucratic procedure. In the organisation, we do not design products for customers, and so we do not have to consider how to control the

process quality of product development and design. However, to ensure that all customer technical requirements are correctly expressed to the organisation (customers make errors and even serious mistakes on their design drawings), it is important that we start a QFD process reviewing and checking all design drawings from customers, and get customers involved in our QFD process by interviewing them. In addition to representatives from other functional departments, representatives from the Sales Department must thus be involved in the QFD team as the interface with customers. The mission of this QFD team will be: reviewing and checking all design drawings from customers; clarifying questions and queries; deciding whether the products can be made; deciding how they will be made; deciding what specific resources should be used for the production; deciding what the lead time should be for the delivery of the products; and deciding what prices should be quoted to customers. Through these processes, customer needs will be clarified and translated into production specifications, and potential quality issues may be found even before the production starts.

To ensure that this QFD team could play its role effectively as expected, the leader of this team must have training as a facilitator instead of a manager; the top management must absolutely support this team to make any decisions independently; and representatives from different functional departments must be empowered to make independent and immediate decisions on behalf of their own departments without reporting to their managers or supervisors.

2.6.2 Becoming a competitive supplier for target customers

As informed by the reviewed literature, a mechanism of raising service support and personal interaction with customers should be established in the organisation to create superior supplier reliability and customer dependence as the value in the supplier-buyer relationship between the organisation and its customers.

My organisation is in international business and usually we do not work in synchronous time with customers due to the difference between China time and the local time of the countries where customers are based. As a result, although all Business Representatives are required to carefully look after their customers and

provide any service support on request as rapidly as possible, in most cases responses cannot be made to customers immediately and on the same day. In such a situation, Business Representatives may have been trying their hardest to look after customers, but customers might still feel unsatisfied and expect improvements to be made in the organisation so that immediate responses can be made, especially when serious quality or commercial issues emerge and urgent supports from the organisation are needed.

Drawing on the knowledge identified from the literature review, I intend to establish a dedicated customer support team involving Business Representatives, engineers and top management as its members. In this team, Business Representatives will play the dual roles as the source of commercial solutions against commercial issues and the interface between the organisation and customers; engineers will be the source of technical solutions against technical issues; and the top management will play the role as the source of authorisation when needed. When needed by customers, Business Representative may source solutions from either engineers or the top management at any time.

As this team will function to improve the personal interaction with customers and provide prompt service support as expected by customers, Business Representative will be allowed to keep their work time flexible so that they can work closely and synchronously with customers as long as possible per working day and respond to customers promptly as expected, and agree with customers the timescale for addressing any issues or questions as requested by customers.

2.6.3 Building an effective relationship with suppliers

As informed by the knowledge idenfied from the previous studies, an effective relationship with suppliers may be realized through managing trust in the business relationship with suppliers who do not have the potential to abuse the firm's trust, and the trust should be developed through enhancing social factors such as long-term agreements, openness, honesty, words backed by actions, on-time payment and being kept informed as the key elements.

Currently, it is the Purchasing Department that is in charge of supplier management

with traditional tools and techniques drawn from ISO9000, without being enhanced in developing social relationship with suppliers. To develop trust with our suppliers through enhancing social factors, I think a team should be established to develop suppliers who tend to appreciate the firm's trustworthy manner with them and developing and maintaining trust with right suppliers. In such a team, both the Managing Director and buying staff should be involved as team members, because actions concerning social factors not only need buying staff to implement, but also need the Managing Director to empower them in the first place according to situation.

With this team, suppliers' needs, wants and preferences may be clearly understood and met in time, individual relationships between the firm and suppliers may be constructed through enhancing social factors, and the possibility for the firm to be perceived as preferred customers may be increased, leading to additional support and cooperation from suppliers may be achieved for future business operations.

2.6.4 Motivating employees for better performance

It is evident in the reviewed literature that employee performance may be improved through motivating employees in the firm, and I think it may be achieved by empowering employees to make decisions and solve problems. In addition opportunities should be explored to recognise the employees' fulfilment of contracted tasks and extra contributions with rewards such as bonuses and promotion. This could be implemented immediately by involving as many employees as possible in solving the problem of my thesis project.

A team may be established to constantly survey: (a) what conditions in the workplace are expected by employees from different business units; (b) how employees from different business units want to be empowered in decision making and problem solving; and (c) how employees from different business units want to be rewarded on fulfilment of contracted tasks and extra contributions made by them.

With the efforts made by such a team, employees might regard their work life as important as their personal life and would like to stay with the firm as long as possible to make contributions for not only the firm but also themselves.

2.6.5 Integrating the most relevant knowledge into one solution

The discussions in Section 2.6.1 to 2.6.4, suggests that in theory I could make improvements in the four areas through:

1. forming a QFD team to replace the existing bureaucratic production procedure;

2. establishing a customer support team to improve the personal interaction with customers and provide prompt service support as expected by customers;

3. constructing a team to manage trust with the right suppliers; and

4. building a team to manage empowerment and recognition of employees' fulfilment of contracted tasks and extra contributions.

Establishing a total four teams (one in each area), the problem might be solved.

For large organisations, four separate teams may be just established with single-functional staff members from different business units and left to function independently from each other, because large organisations have enough human and financial resources to implement such a change.

However, as a small organisation, the firm does not have enough single-functional staff members to fill different business functions; instead, most of the office and management staff members have several roles in different business units and routinely these staff members need to work together in a collaborative manner. Thus, it is not feasible at all for the firm to establish four totally separate teams consisting of single-functional staff members; instead, each team member might need to play multiple roles across more than one team of these four teams, and these four teams need to be integrated so that limited human and financial resources may be effectively shared. Establishing and integrating these four streams of work therefore is the key methodological challenge for my research.

In summary, in Chapter 1 the overall research question has been is identified as: *How can a small low-end manufacturing enterprise in the international business environment achieve a competitive high-end supplier status that can sustain for the long term?* Four subquestions have also been identifed to guide the literature review allied to four areas identified at the firm for performance improvement. As I have

learned from the literature review, the four streams of identified theoretical solutions have resource implications that could not be met by my small firm. Therefore, there is a need to integrate the four areas of performance improvement so that limited human and financial resources may be effectively shared in my firm. This integration is therefore identified as the key methodological challenge for my research, with the question identified for my action research being: *how can these four streams of theoretical solutions be integrated given the limited human and financial resources within my firm*?

Whilst a methodology of action research is justified given the goal of seeking performance improvements with the aid of employees, there is also a need to ensure the methodology is systemic in order to cover all functions within the firm, therefore my empirical work will be conducted with systemic methods. In the next chapter I will introduce soft systems methodology (Checkland and Howell, 1993) as the action research approach to address the four areas of improvement in the context of the limited resources available in my organisation.

Chapter 3. Methodology

3.1 Introduction

As discussed in Chapter 1 and Chapter 2, it has been determined that my problem should be solved systemically in order to integrate four streams of improvement activity. Such integration is necessary because of the limited human and financial resources within my firm. The key methodological challenge for my research is to integrate four areas of improvement need in a firm-wide systemic manner. Moreover, both internal and external effects to my organization must be considered in the four streams of activity. On the basis of these requirement my empirical work will follow the soft systems methodology (Checkland and Howell, 1993), which is a systemic action research methodology and considers effects from both external and internal business environments of organizations.

The structure of this chapter is as follows. Section *3.2* will introduce Soft Systems Methodology (SSM) in general terms. Section *3.3* will then explain how Soft Systems Methodology (SSM) was used in my empirical work in dealing with research sample, data generation, research findings and the recommendation of actions for changes in a systemic manner.

3.2 Soft systems methodology

In this section, it will be explained how and why Soft Systems Methodody (SSM) was selected as the most suitable methodology for my action research.

3.2.1 Soft systems vs hard systems

According to Checkland and Holwell (1993), mechanical systems have definite boundaries between them and their environment, and they do not have to be influenced by the effects from their environments; they are termed hard systems. In contrast, unlike mechanical systems, there are no definite boundaries between business organisations and business environments, and all internal human activities are directly and dynamically influenced by the effects from their business environments. Business organisations are regarded as soft systems and to survive in such soft systems, management systems must adapt to effects from business environments, and it is the organisational members that are change agents and

collaborate to construct management activities.

3.2.2 SSM in research

For action research purpose, there is a variety of action research paradigms (Coghlan & Brannick (2010) and types of qualitative inquires (Creswell, 2007) to be adopted.

As analyzed in Chapter 1 and Chapter 2, I intended to solve my problem from a multiple-dimension improvements, so action research paradigms for addressing management problems from an single-dimension improvements might not be suitable for addressing my problem.

My firm is an small engineering company that can be designed, and compared with other action research paradigms SSM emerged out of an engineering management approach towards organisational design. Thus, there is a fit between the paradigm behind the methodology and the engineering culture of my firm.

Also, SSM is a participative form of action research, which means that ideas from employees are given greater prominence than ideas from the literature. Consequently my literature review can be used to suggest ideas to employee participants without constraining them. This fits with the general aim of improving employee motivation along with other aims for solving my problem.

Checkland and Holwell (1993) argue that, in research, SSM is a suitable and effective holistic approach for systems thinking, especially in messy and complex problem situations where people from different business units have different views and interests (Vickers, 1968; Andrews, 2000), as a result, it is very difficult for a consensus to be reached if solutions are made separately. Elliman and Orange (2000) believe that in business organisations, the application of SSM in research can lead to purposeful activities for change to be made collectively through a process of seven steps (Checkland, 1999):

1. Enter the unstructured situation of the researched problems;
2. Express the problem situations through constructing Rich Pictures (Monk and Howard, 1998) of the researched problems;
3. Finalise the root definition of systems of purposeful activities;
4. Form the conceptual model of human activities for future;

5. Compare the conceptual model and the real world;

6. Define desired and feasible changes; and

7. Enact actions to be taken.

SSM provides a structured process for addressing an organisational challenge in collaboration with others in the organisation. Opportunities for action and reflection are provided at each of the 7 steps of the process.

In the problem situation for my research, I think SSM would be the most suitable for helping conduct the research, as first of all the problem is an organisational level issue, which means the research would involve people from different management levels and different business units with different views and interests. When interacting with each other, people from different management levels and different business units have complex and dynamic interrelationships. As a result, it might be very difficult to reach a consensus on how all activities should be organised together and what actions should be taken in future, and resistance to change might emerge at any time.

Secondly, as the problem concerns the management of a small firm, it cannot afford to take risks with new but potentially incorrect actions for each of the four separate teams. Instead, it is desirable that a systems-thinking approach that may help the organisation reflect on what it has been doing and how, and compare that with what and how we should do in the future so that a set of improvement actions may be worked out together at low risk.

Finally, given the complexity identified above, SSM as a systemic approach may effectively help the organisation holistically adapt to the identified effects from customers, competitors, suppliers and employees, leading to an effective solution to the problem by producing the outcomes of my research. This will include: (a) management activities to be re-organised and coordinated together in future; (b) the gaps between purposeful activities for future and current activities in the organisation; and (c) the actions to be taken to fill the gaps between purposeful activities for future and current activities in the organisation.

So, on the basis of all the above discussions and and compared with other alternative methdolodies, soft systems methodology (Checkland and Howell, 1993) was finally

chosen as the most suitable methodology for my empirical work.

3.3 The application of SSM, in conjunction with the identified existing knowledge, in the research

In this section, it will be explained how SSM and the identified existing knowledge from literature review played their roles for my action research, including how how SSM and the identified existing knowledge were applied to my action research, how participants were identified for my action research, how participants played their roles in my action research and how data was collected and processed in my action research, in the following sub-sections:

3.3.1 The application of SSM in conjunction with identified existing knowledge

Generally, SSM was employed throughout the research process in classic manner, and I acted as a facilitator for the process. As informed by Coghlan & Brannick (2010), I intended to design my action research as a democratic and double-loop process, including core action research process and thesis action research process, that involved the participation of internal stakeholders as the participants and co-researchers. As this research took place the firm where I was a Director, I therefore played the role as the insider researcher (Coghlan & Brannick, 2010).

In my SSM work, each of the seven steps in the SSM process was thought of a proceeding through a cycle of actions and reflections, with the specific organizational design activities of that stage of the SSM process as the actions, which were done in co-operation with my insider participants. There was also a reflective activity in each stage, of which in some cases it followed directly from the design activity. This was manifest as the discussions with participants of the output from each step.

In addition, in the action research I undertook conscious reflection as an insider-researcher at the end of each SSM step, to reflect upon the research process and decide what should be pay attention to in next SSM step.

Finally, as shown in Figure 1, in the design of my action research SSM was applied in conjunction with the existing knowledge identified from the Literature Review through three stages:

- Stage 1: determination of participants as informed by the literature review

- Stage 2: following the 7 steps of SSM for data collection, analysis, reflection and associated actions;

- Stage 3: discussion of actionable knowledge.

Stage 1, Determination of participants, guided by identified existing knowledge			
Themes of fragment solutions for the problem, as guided by existing knowledge from literature review			
1, establish QFD team to satisfy customers' quality requirements.	2, establish customer support team to improve competitive advantages.	3, establish supplier trust development team to improve supplier relationship.	4, establish employee motivation management team to improve employee performance.
↓ ↓ ↓ ↓			
The pool of participants			
Participants as internal stakeholders for the action research of my thesis research project.			
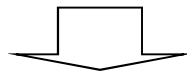
Stage 2, Data collection, analysis and presentation, guided by SSM
Step 1. Enter the unstructured problem situation for the research and collect data from participants.
Step 2. Express the structured problem situation for the research with the Rich Picture.
Step 3. Root definition of the purposeful activity system for future in the firm.
Step 4. Conceptual model of the purposeful activity system for future in the firm.
Step 5. Comparison between the conceptual model and the real world in the firm as described in Step 1 and Step 2.
Step 6. Identification of needed changes to fill the gap between the conceptual model and the real world in the firm.
Step 7. Actions to implement the needed changes.
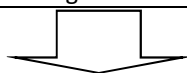
Stage 3, discussion and statement of Actionable Knowledge

Figure 1 - Application of SSM and existing knowledge in the research model

3.3.2 Identifying the participants

In order to identify and agree the participants in the research, two meetings were held by me in my organization. Firtly, I organised the first meeting and presented the findings from my Literature Review as the basis to discuss and finalise: (a) what activities should be organised for each of the four performance areas; (b) who should be involved as key internal stakeholders for each fragment solution; and (c) who

should be involved together in the research as both informants and members of the research team.

On this meeting, the Managing Director, the Chief Engineer and managers of all business units were involved to discuss on the above topics. I played the role as the facilitator to make sure that the process could be gone through successfully towards identifying the potential participants needed for my empirical work. Each participant was allowed to decide in his/her own business unit what acctives should be organized and who whould be needed as the potential participants of my action research against each fragment solution fo my problem. This meeting was rather smooth as all members were cooperative and actively suggesting what activities should be organized and who should play the role as the actors in their own business units. Finally it only took less than 3 hours to complete the discussion on all topics. As the outcome of this meeting, a consensus was reached, and this is reproduced in Table 1, and explained in the following paragraphs.

Table 1 - Determination of participants of the research

Fragment Solutions for My Problem	Needed Activities	Needed Staff Members	Desired Participants of My Action Research
1, establish QFD team to satisfy customers' quality requirements.	Review and check customer drawings.	Business Representatives; Chief Engineer; Production Engineers; Purchasing Manager; Quality Engineers.	Business Representatives; Chief Engineer; Production Engineers; Purchasing Manager; Quality Engineers; Financial Manager; Human Resource Manager; foremen of workshops; the Managing Director.
	Clarify questions with customers		
	Decision of manufacturing ability.		
	Decision of manufacturing process.		
	Decision of specific resources needed.		
	Decision of lead time for delivery.		
	Decision of prices to quote customers.		
2, establish customer support team to improve competitive advantages.	Any enquiries, questions, queries or feedbacks of quality issues must be responded immediately without delay, even if no solutions or answers could be given immediately.	Representatives; Chief Engineer; Managing Director.	
3, establish supplier trust development team to improve supplier	Develop right suppliers	Purchasing Manager; Financial	
	Develop and maintain trust with suppliers.		

		Manager; Managing Director.	
4, establish employee motivation management team to improve employee performance.	To survey expected work conditions.	The Human Resource Manager; foremen of workshops; the Managing Director.	
	To survey how employees want to be involved in decision making process.		
	To survey how employees want to be rewarded on fulfilment of contracted tasks and extra contributions.		

From the literature review we learnt that to run a QFD team to satisfy customers' quality requirements, necessary tasks should include:

1. review and check all design drawings from customers;

2. clarify questions and queries with customers;

3. decide whether the products can be made;

4. decide how the products will be made;

5. decide what specific resources should be used for the production;

6. decide what lead time there should be for the delivery of products;

7. decide what exact prices should be quoted to customers for products.

Through these processes, customer needs would be exactly clarified and translated into production specifications, and potential quality issues could be effectively found in advance. The implications of these processes in our firm was that staff members involved in these management activities should include: Business Representatives for translating business languages and keeping communicating with customers on requests; the Chief Engineer for proposing technical solutions; Production Engineers for proposing production ability and plans; Purchasing Managers for proposing purchasing ability and plans; and Quality Engineers for proposing quality control ability and plans.

To run a customer support team to improve competitive advantage, all customers should be carefully looked after by the Business Representative who originally developed these customers, and any enquiries, questions, queries or feedbacks of quality issues must be responded immediately without delay, even if no solutions or

answers can be given immediately. Customers must be made to feel that they are supported at all times, especially when serious quality or commercial issues emerge and urgent supports from the organisation are needed.

Accordingly, staff members to be involved in these management activities should include: Business Representatives in the dual roles of both the source of commercial solutions and the interface between the organisation and customers for customer support; the Chief Engineer as the source of technical solutions; and the Managing Director as the source of authorisation when needed by Business Representatives. When customer support is needed the Business Representative must be empowered to source solutions from the Chief Engineer, the Managing Director or any other resource at any time.

To improve the personal interaction with customers and provide prompt service support as expected by customers, Business Representatives are allowed to keep their work time flexible so that they can work closely and synchronously with customers as long as possible per working day and respond to customers promptly, and agree with customers the timescale for addressing any issues or questions.

To run a supplier trust development team to improve supplier relationship, required activities should include developing the right suppliers who tend to appreciate the firm's trustworthy manner and developing and maintaining trust with the right suppliers, so that supplier needs, wants and preferences could be clearly understood and met in time. Individual relationships between the firm and suppliers could be constructed through enhancing social factors, and the expected support and cooperation from suppliers could be surely achieved for future business operations.

Accordingly, it is obvious that the Purchasing Manager should be involved. However, because actions considering social factors also need the Financial Manager to make payment to suppliers in time and the Managing Director to either delegate or be involved in negotiating with suppliers according to situation, so the Financial Manager and the Managing Director should also be staff members to be involved.

To run an employee motivation management team to specifically enhance empowerment and recognition of employees' fulfilment of contracted tasks and extra

contributions, activities should be implemented to constantly survey: (a) work conditions expected by employees, especially those on the shop floor; (b) how employees, especially operators on the shop floor, want to be involved in decision making and problem solving; and (c) how employees want be rewarded on fulfilment of contracted tasks and extra contributions made by them.

Accordingly, staff members to be in charge of employee motivation management should include: the Human Resource Manager for surveying requests and expectations from employees; foremen of different workshops as the representatives of operators who usually are not involved to give their voices in decision making process; and the Managing Director who needs to delegate according to the situation or suggestions made by the Human Resource Manager.

To ensure that decisions could be made effectively, the top management must support this team to make any decisions independently, and representatives from different functional departments must be empowered to make independent and immediate decisions on behalf of their own departments without reporting to their managers or supervisors.

In summary, in order to solve my problem effectively, I need all functions in my firm involved in my research. So, for the four fragment solutions for the problem, the complete group of desired participants for the research would include: Business Representatives (3 in total); the Chief Engineer; Production Engineers (4); the Purchasing Manager; Quality Engineers (4); the Financial Manager; the Human Resource Manager; foremen of workshops (4); and the Managing Director. In total twenty team members were selected as the representatives of all functions.

The second meeting was for the formal recruitment of all the desired participants proceeded in accordance with University of Liverpool research ethics procedures, with the receipt of enough Informed Consent Forms from potential desired participants for my empirical work as the expected final outcome. this meeting was held involving all staff members of my organization at which the background, purpose, importance and expected outcome of the research were explained, and how I would play my role as both researcher and their colleague. Questions from staff members were answered in

accordance with the Participant Information Sheet approved by DBA Research Ethics Committee of Liverpool University. After this meeting, person-to-person interviews were organised with each staff member separately and privately to clarify any further questions. As a result, I received signed Informed Consent Forms from all staff members needed to be participants of my research.

3.3.3   Role of the participants with the action research process

The research was designed as a group decision making process, with the outcome of the research being co-produced by all participants. Thus, all participants were also treated as co-researchers.   The "actions" undertaken in the research were organisational design activities, and these were done in a coperative way with the employee participants (see Table 1).   These activities are organisationed in terms of the seven steps of the SSM process and are explained in detail in Chapter 4. In general terms the action research work involved them gathering and analyzing data to inform design of new operational processes to achieve the reachch objectives that could lead to finally solving my problem.   The important features of this approach are: (i) all functions of my firm were involved as the participants and co-reserachers for my action research; (ii) each step of SSM work is associated with different and specific inquiries; (iii) the inquiries involved gathering and analyzing data from our firm with participants collectively. The endpoint of the whole process was the recommendation of new operational activities.

Although a complete evaluation of all recommended actions was beyond the timescales of my thesis project an interim evaluation is presented in Chapter 5. Thus, an evaluation of progress after the first 6 months of the new operation was made, with the involvement of some participants of my action research to gather empirical data. In addition Chapter 5 compares the observed changes in my firm with with ideas from reviewed literature.

In practical terms, as we progressed through the SSM procedures (Figure 1), data were generated and discussed in conjunction with all the participants through a series of meetings. In these meetings we analysed the collected data and finalised the Rich Picture of the problem, and then agreed the root definition of the system of

purposeful activities for future as the teamwork. Subsequently we finalised the model of the system with purposeful activities for the future. We compared the system of purposeful activities and the real world in the firm and identified critical gaps in our operations. In another session we agreed the desired changes to our operations and drafted an implementation plan of a series of actions to be taken. In the conclusion phase of the research project, the actionable knowledge contributed to the firm was identified.

3.3.4 Data collection, analysis and presentation

All data were collected, analysed and presented by going through the process from Step 1 to Step 6 of SSM, and an implementation action plan to be taken by the firm was produced and suggested to the Managing Director as Step 7 .

The data were collected, analysed and presented as below according to standard SSM practices (Checkland and Howell, 1993).

Step 1: entering the unstructured problem situation of the research and collecting data from all the participants.

In order to gather all participants viewpoints on the objective of becoming a high end supplier individual interviews were held separately and privately with all participants to collect data concerning: (a) views of the problem situation; (b) the concerns by participants on the implementation of the four fragment solutions in the firm; and (c) their suggestions on how to implement the four fragment solutions in the firm. The collected data was categorised into different groups according to the different business units of the participants, to identify themes of each business unit.

The interview protocol itself was piloted with a couple of participants in order to verify and correct the design of interview questions and grouping of interviewees.

Step 2: expressing the structured problem situation for the research as a Rich Picture.

 A rich picture is an important tool to sum up the most important components of the problem situation so that the unstructured problem can be expressed with a structure. With the categorised data collected from all participants, I raised and proposed a draft Rich Picture, and a workshop was set up involving all participants to discuss about how

the draft should be modified to holistically reflect the real situation in the firm.

As the outcome produced by this workshop, the formal Rich Picture was collectively finalised as the structured expression of the real world for the problem and key themes for the research were identified.

Step 3: finalising the root definition and analysing the "CATWOE"

The purpose of this step is to develop a root definition of a system that could help improve the problem situation. This root definition is an important textual statement presenting the most important elements of the modelled system of future purposeful activities. To produce an effective root definition, I raised and proposed the draft statement of the root definition of the system of the conceptual model and a workshop was set up involving all participants to discuss collectively how the statement could be improved. The quality of the root definition is assessed with reference to a set of criteria that together have the abbreviation "CATWOE". The letters of the abbreviation act as a reminder to ensure the root definition incoporates the following elements: 1. **C**ustomers to benefit from transformation made by the system; 2. **A**ctors to perform human activities of the system to enact transformation; 3. **T**ransformation to be made by the system; 4. **W**eltanschauung (or world-view) that makes the transformation meaningful; 5. **O**wners of the system; 6. **E**nvironmental constraints that limit what might be done as human activities*) of the future purposeful activity system.*

As the output produced by this workshop, input and output of the transformation process, CATWOE and a formal table of the statement of root definition were finalised.

Step 4: finalising the conceptual model of the future purposeful activity system.

The conceptual model (of SSM) represents the minimum set of purposeful human activities as specified in the root definition. To lead the discussion to the conceptual model effectively, I raised and proposed a draft conceptual model, and set up a workshop involving all participants to discuss what purposeful human activities should be incorporated in the modelled system, and how the draft model should be improved and perfected.

As the output produced by this workshop, the formal modelled system of future purposeful activities in one complete system was collectively finalised.

Step 5: comparing the conceptual model and the real world in the firm.

A comparison between the model of purposeful activities and the real world of the firm is very important to identify activities which are poorly done, or which are not done at all, so that recommendations for improvements can be made. To organise the comparison effectively, I proposed a draft table listing all the purposeful human activities identified from the modelled system finalised in Step 4, and set up a workshop involving all participants to consider what activities were poorly done or not done at all.

As the output of the comparison, a formal table of three columns – purposeful activities, how they were done in reality, and comments and recommendations – was collectively finalised.

Step 6: Identifying feasible and desirable changes to fill the gap between the conceptual model and the real world in the firm.

A table of desirable changes is important for presenting changes to be made in the firm, and should be based on the comparison table finalised in Step 5. In the same workshop set up in Step 5, an additional discussion was organised based on the formal comparison table.

As the output of this discussion, a table of four columns – purposeful activities, how they are done in reality, comments and recommendations, and desirable and feasible changes – was finalised.

Step 7: suggesting an implementation action plan to fulfil the changes.

Immediately after the discussion of desirable and feasible changes, in the same workshop, actions to be taken to fulfil the changes, the timescale of enacted actions and actors were discussed and finalised based on the table produced in Step 6.

As the outcome of this final workshop, a set of formal tables showing: purposeful activities; how they are done in reality, comments and recommendations, desirable

and feasible changes, actions to be taken, starting time and completion time, and responsible actors was handed over to the firm for planning and implementation.

Chapter 4. Data Collection and Research Findings

Introduction: drawing on the SSM methodology, this chapter presents in detail how the data was collected, what was found, what changes were identified for improvements and what actions were suggested to taken for fulfilling the changes. The length of this chapter reflects the throughness of the SSM process. Each of the seven steps of the process is presented as a section within the chapter. Each section will include a brief statement of the purpose of that step of the SSM before giving an account of the appropriate research activities (data collection, analysis, workshops), and presenting the key outputs from each step. Each section will end with my reflections of the progress up to that point in the SSM process.

In my empirical work, all data was collected through interviewing 20 participants drawn from all functions in my firm and including: Business Representatives (3 in total); the Chief Engineer; Production Engineers (4 in total); the Purchasing Manager; Quality Engineers (4 in total); the Financial Manager; the Human Resource Manager; foremen of workshops (4 in total); and the Managing Director. All these interviewees were selected in the Stage 1 of my action research as described in Section 3.3.2 of Chapter 3.

4.1 The unstructured problem situation (Step 1 of 7 of SSM)

In this section, it reports how data was collected and presented in the following sub-sections, with Table 4 produced to reflect the unstructured situation of my problem.

4.1.1 The purpose of Step 1

According to Bowen and Shehata (2001), the essence of the Step 1 of SSM is to have a broad view of the problem and understand it generally. With Step 1 of the SSM project, I aimed to have a wide view and a general understanding of the unstructured situation of the problem through interviewing participants in my research to collect data for constructing the Rich Picture in Step 2.

4.1.2 Plan for data collection

Drawing on the Literature Review in Chapter 2, the problem might be solved by approaching four streams as improvement objectives, as discussed above. However,

due to limited human resources in the firm, it is a more practical approach to have the four streams integrated, although it is still a challenge. As a result, how to integrate these four streams in the business context of the firm can be thought of as the overarching question for my action research.

I designed an approach to data collection for Step 1 of the SSM project allied to the four streams of improvement objectives, and then interviewing participants and asking specific questions that could guide participants to express their different views of the problem, which reflected its unstructured situation.

4.1.3 Design of questions for data collection

To have specific questions for collecting data effectively, a trial interview was held with four interviewees separately chosen from the four groups of participants. During the course of this trial interview, each interviewee was asked two questions for trial purposes (see Table 2). All these questions were designed by me as the researcher and facilititor in Step 1 of my SSM work.

Table 2 - Questions for the trial interviews

Interviewee No. 1 (a) How have you been doing your job to date for satisfying customers' quality requirements? (b) What are your suggestions for improving your specific situation?
Interviewee No. 2: (a) How have you been doing your job to date for becoming a competitive supplier for multiple customers? (b) What are your suggestions for improving your specific situation?
Interviewee No. 3: (a) How have you been doing your job to date for building an effective relationship with suppliers? (b) What are your suggestions for improving your specific situation?
Interviewee No. 4: (a) How have you been doing your job to date for improving employees' performance? (b) What are your suggestions for improving your specific situation?

However, when I asked these questions, I found that these interviewees were not able to focus on exactly what I was expecting them to describe; instead, what they were able to tell me was how they did what they were instructed to do in their positions every day, and not how their jobs directly and contributed to either satisfying customers' quality requirements, becoming a competitive supplier for multiple customers, building an effective relationship with suppliers, or improving employees' performance. This was because they had never been asked to think about it in a formal

manner, and so it was also very difficult for them to make any suggestions directly.

To help these four interviewees effectively focus on thinking about how they had played their roles to date in contributing to these improvement objectives, an additional question was asked to each interviewee: *how do you summarise your role in one sentence?* This additional question was challenging but all interviewees said that it helped them reflect on their roles and answer other questions in detail more easily. Four groups of questions for formal interviews and data collection were finalised, as summarised in Table 3.

Table 3 - Questions for formal interviews and data collection

Groups of Specific Questions	Target Participants and Work Stream
a) how do you summarise your role in one sentence, for exactly satisfying customers' quality requirements? b) how have you been playing your role to date for either exactly satisfying customers' quality requirements? c) what is your suggestions for improving your specific situation?	Stream One Participants for forming a QFD team to satisfy customers' quality requirements
a) how do you summarise your role in one sentence, for becoming a competitive supplier for multiple customers? b) how have you been playing your role to date for becoming a competitive supplier for multiple customers? c) what is your suggestions for improving your specific situation?	Stream Two Participants for establishing a customer personal interaction support team to improve competitive advantage.
a) how do you summarise your role in one sentence, for building an effective relationship with suppliers? b) how have you been playing your role to date for building an effective relationship with suppliers? c) what is your suggestions for improving your specific situation?	Stream Three Participants for constructing a supplier trust development team to improve supplier relationship.
a) how do you summarise your role in one sentence, for improving employees' performance? b) how have you been playing your role to date for improving employees' performance? c) what is your suggestions for improving your specific situation?	Stream Four Participants for building an employee motivation management team to specifically enhance empowerment and recognition on employees' fulfilment of contracted tasks and extra contributions.

4.1.4   Grouping of specific interviewees

Participants for the four work streams of improvements had already been identified and as part of Step 1 of the SSM process, these participants were categorised in four different groups as specific interviewees, as summarised in Appendix 4.

4.1.5 Interviews of participants from the same business unit

During the course of the trial interview, it was also found that participants from different business units felt uncomfortable either being interviewed individually or together with others from different business units; instead, participants expressed that they would like to be interviewed together with colleagues from their own business units, which might make them not only comfortable but also confident. Immediately after the trial interview was complete, a meeting was held involving all participants of my research to discuss how participants should be interviewed, individually or participants from same business units to be interviewed together in groups.

As discussed above, rather than personal interviews, it was requested by the participants of my action research that they preferred to be interviewed in groups, and I respected such a collective decision made by the co-researchers.

Although Jannis (1973) thinks groupthink traps might occur and bring out the wrong decisions when group members sought concurrence in group interviews, I thought this disadvantage could be overcome through analysing both positive and negative points with all group members (Žapčević & Butala, 2013) in interviewing process.

As informed by Raelin (2003) regarding the advantage of group interviews, in the interviewing process each member could play the role as the leader of the group when needed in different stages, and each member could have the opportunity to raise personal views on the topics in discussion but be challenged/corrected by others. It helps to enhance the chance to reach a concensus.

It was then agreed that participants from the same business units should be interviewed together in groups, so that each participant could express their personal point of view freely and comfortably, and each participant's personal point of view could be verified or even challenged by colleagues, which would be the effective data for my research.

To help time management for each interview, the questions that would be used to collect data were given to all participants in advance so that they could be prepared before being interviewed.

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4.1.6 Data collection and findings

In total, 14 groups of interviews were conducted, with about 20 minutes for each interview group. Based on the detailed data collected in Appendix 1, a summary was made (Table 4).

Table 4 - Summary of collected data in Step 1 of SSM

Work Stream	Business Units	How do you summarise your role in one sentence?	How have you been playing your role to date?	Suggestions for improvements?
	Business Representatives from Sales Unit.	We are the interface between customers and our firm.	We (a) receive enquiries, (b) translate customer requirements into local language, (c) request the Chief Engineer for assessing our technical ability, (d) make quotations, and (e) raise shipping and delivery documents.	Quality control over subcontracted products should be improved.
	Chief Engineer' unit.	I supervise the whole manufacturing system.	I (a) organise meetings on request by Business Representatives for new products development, b）work closely with production engineers for regular productions，and (c) organise meetings to study quality issues after delivery.	I am often short of qualified foremen. it should be sorted.
	Production Engineers from Production Engineering Unit.	We plan and programme productions as per purchase orders from customers.	We (a) plan and programme regular productions independently, (b) check both delivered materials, (c) supervise tooling and fixtures, and (d) work closely with quality units.	We (a) want dedicated persons to look after all fixtures and inspection devices, and (b) need enough universe or similar fixtures, to make that all productions can be conducted timely.
	Purchasing Manager's unit	My role is to obtain materials and subcontracted products in time.	we (a) ensure that required materials and material costs can be correctly obtained for new product development, and (b) work closely with other business units to obtain materials and spare parts in time for regular productions.	Requests of spare parts from workshops are not planned properly. It should be improved.
Stream One	Quality Engineers/Inspectors from Quality	We are the watch dog checking finished	We check each products' appearance and dimensions before release to warehouse or despatch to customers' drawings.	We (a) have too many products to check, and (b) need enough

	Control unit.	products.		inspection devices.
Stream Two	Business Representatives from the Sales unit.	We bridge the customers and our firm.	It's for us to (a) negotiate with customers against issues raised from us, and (b) coordinate with both internal business units against issues raised from customers.	No suggestions at the moment.
	Chief Engineer's unit	I assist Sales unit to work out solutions when issues emerge.	Immediately after being notified, I organise the study of issues and work out solutions.	No suggestions at the moment.
	Managing Director' unit	I make decisions when needed.	I make decisions on request by either the Chief Engineer or Sales Units.	No suggestions at the moment.
Stream Three	Purchasing Manager' unit	I build and maintain supplier relationship.	I develop and negotiate with all suppliers. Payment of one delivery batch is usually held in case suppliers break their credit.	No suggestions at the moment.
	Financial Manager' unit	We look after payment suppliers.	All invoices from suppliers are checked immediately received, and paid as soon as possible.	No suggestions at the moment.
	Managing Director' unit	I am not involved.	When suppliers visit our firm, I try to see them in courtesy	No suggestion at the moment.
Stream Four	Human Resource Manager' unit	I look after staff benefits	I work with the Chief Engineer to keep staff members happy, negotiate with staff and decide labour rewards for temporarily additional work.	No suggestions at the moment.
	Headmen of workshops	We bridge the communication between operators and the management.	It's us to explain to our fellow colleagues for instructions from the management, and (b) feedback any issues raised from operators to the management.	No suggestions at the moment.
	Managing Director's unit	I make decisions over key staff members' salary, bonus and benefits.	By the end of every year, I organise person to person interviews with key staff members and negotiate with them how their salary, bonus and benefits might be added next year.	No suggestions at the moments.

With this summary of collected data, it was found that:

1. All participants were able to clearly describe their roles and how they played their roles in each stream of improvement objective they were related to.

2. Participants only made suggestions for improvements in the stream of QFD management for satisfying customer requirements over quality; No participants made any other suggestions.

4.1.7 Researcher's reflections on progress

With these findings, it seemed to me that:

1. Participants were well aware of the importance of satisfying customers' technical requirements, and they also knew they should perform their roles in an active manner towards such a stream of improvements. This was just as I originally expected for data collection.

2. No suggestions made towards the other three streams of improvements might indicate that participants were not yet aware of either the importance of making such improvements, or the importance of their roles in making such improvements. This was not as I originally expected for data collection, because I originally guessed that participants might make many suggestions for improving their specific situation.

This lack of suggestions was also a valuable part of the situation of the problem. It indicated that the problem was not yet owned by participants as their own. According to Wells (1995), experiencing the unstructured situation itself is valuable for defining the problem. From my point of view, the data collected with suggestions and no suggestions reflected the real unstructured situation of the problem, which reminded me that more attentions should be paid on how to motivate participants to get involved for making improvements, from both research objectives and research methodology points of view.

4.2 Problem situation expressed (Step 2 of 7 of SSM)

In this section, it reports how my problem situation would be structured and expressed, with outcome of this section, including a rich picture to express the situation of my problem, key issues identified as challenges in routine business practice, and the critical theme identified for continuing my SMS work.

4.2.1 The purpose of Step 2

According to Platt and Warwick (1995), a Rich Picture is a systemic method to express a problem situation and have the unstructured situation structured, with all

information and relationships represented pictorially. This Rich Picture, together with the theme to be identified for continuing the SSM process, should be the key achievements of this step.

In this step, I aimed to have the situation of the problem expressed and structured through processing the data collected in Step 1 as the raw materials, collectively with all participants.

The construction of my Rich Picture

A meeting was held involving participants from all business units for the research to construct my Rich Picture and identify key issues from it. Before it could be effectively formed, enough information and relationships had to be obtained. To do so, two activities were organised with all participants. First, based on all the data collected in Step 1, each business unit's responses were consolidated to reflect a complete view. Next, participants were asked to identify who were related closely to their specific situations as stakeholders.

To obtain clear information from each business unit, they were given 30 minutes to discuss and come to an agreement. Their conclusions are detailed in Table 5.

Table 5 - Information and relationships

Business Units	Description of Roles, Concerns and Difficulties	Stakeholders.
Sales Unit	We are the interface between customers and firm. We are not confident over subcontractors' quality control. We want to be informed ASAP as quality issues emerges in workshops.	The Managing Director and the Chief Engineer, and customers as the external stakeholders.
Chief Engineer	I supervise the whole manufacturing system, but I am always short of qualified foremen for workshops	The Managing Director, Production Engineering Unit, Purchasing Unit, Human Resource Unit, Quality Control Unit, and Headmen of Workshop floors.
Production Engineering Unit	We report to the Chief Engineer and make production plans. We think fixtures are not audited frequently enough and we do not have enough universal fixtures to use.	The Chief Engineer, foremen from workshop floors and Purchasing Unit.
Quality Control Unit	Some time we have too many products to inspect in time, and we do not have enough inspection devices to use.	The Chief Engineer, Production Engineer Unit and Purchasing Unit.

Human Resources	We plan recruitment and staff benefits as per the Chief Engineer's instructions.	The Manager Director and the Chief Engineer, and competitors as the external stakeholders.
Headmen from Workshop floors	We bridge the communication between staff members on workshop floors and management.	The Chief Engineer and Production Engineering Unit.
Financial Unit	We check invoices from suppliers and make payment to suppliers.	Purchasing Unit, as week as suppliers as the external stakeholders.
Purchasing Unit	Requests of standard spare parts from production and inspection units are not planned properly.	The Chief Engineer, Production Engineering Unit, Quality Control Unit, and suppliers as external stakeholders.
Me, the researcher, as the Director of European and North American Market Development	I think: (a) the initial reply to emails from customers are not made immediately; (b) the appreciation to suppliers by the Managing Director is not represented enough; (c) staff members' contributions are not formally recognised enough by the firm.	The Managing Director, the Chief Engineer and Sales Unit, and customers as the external stakeholders.
The Managing Director	I make decisions for investments and expenses on request.	The Director of European and North American Market Development, the Chief Engineer, and competitors as the external stakeholders.

Immediately after this table was complete and presented to all participants, we started to think about how the layout of the Rich Picture should be planned. It was clear that the Chief Engineer was related to all business units, excluding the Financial Unit, as a stakeholder, so it was collectively agreed that the Chief Engineer should be placed in the centre of the Rich Picture.

Customers were related to me and to the Sales Unit; suppliers were related to both Purchasing and Financial Units; and competitors were related to both the Human Resource Unit and to the Managing Director. It was thus agreed that these business units should be placed in corners of the Rich Picture. Other business units, including the Production Engineering Unit, the Quality Control Unit and the Foremen, could be placed in any positions remaining.

As a result, the Rich Picture was drawn by me and validated through a collective

discussion with all participants, as shown in Figure 2.
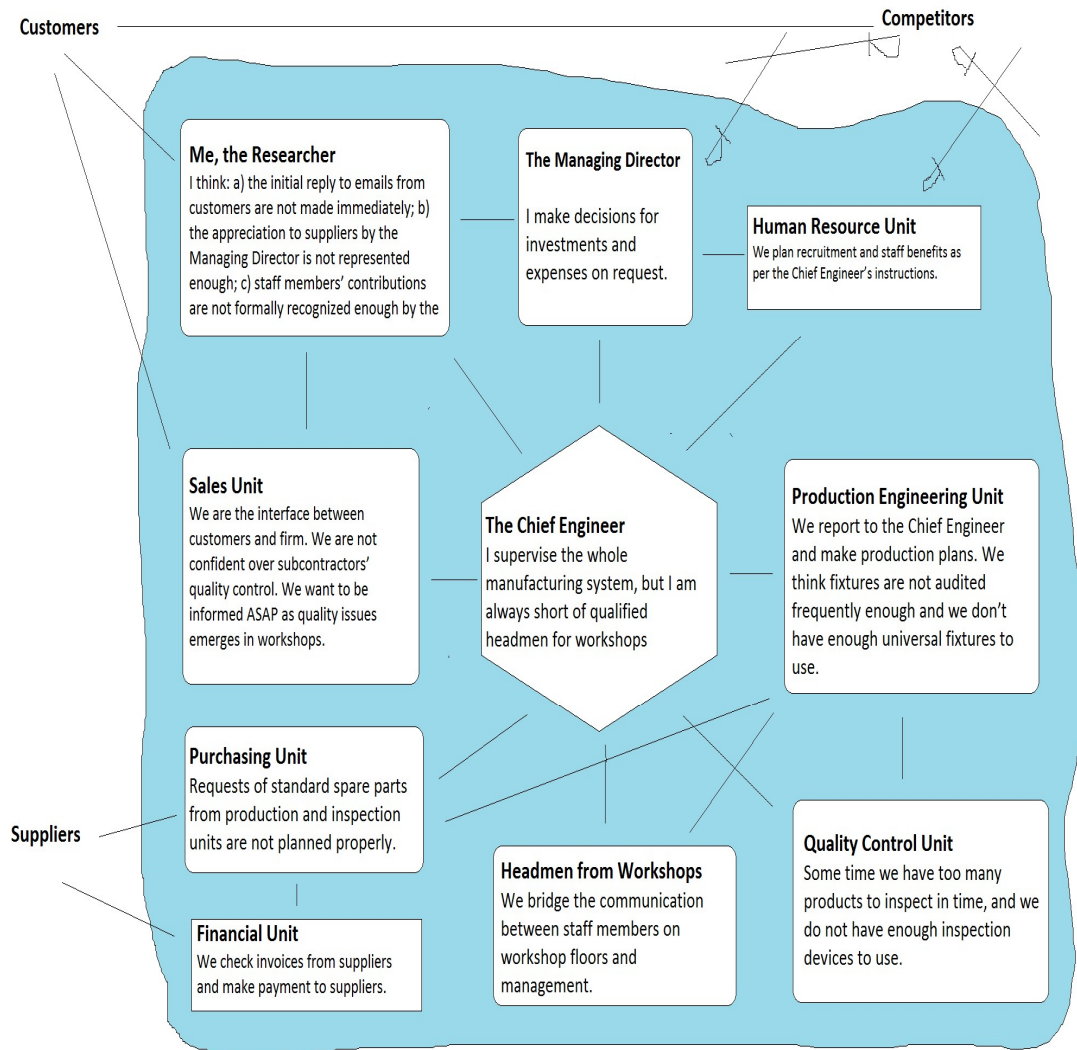
Figure 2 - The Rich Picture

With this Rich Picture, the unstructured situation of the real world was structured, which was needed for key issues and the theme for the SSM process to be identified later.

Identification of key issues from the Rich Picture

Immediately after the Rich Picture was constructed, participants were asked to identify key issues and the challenges faced by the firm. Instead of merely suggestions made towards the work stream of QFD management with Step 1 of the SSM process, participants showed much more enthusiasm in expressing what they thought should

be of issues for the Rich Picture. As a result, a lot of issues were actively and clearly identified and expressed by participants towards all streams of improvement.

Based on all the statements made by participants (see Appendix 2), 10 key issues were identified as listed in Table 6.

Table 6 - Key Issues

Work Stream	Key issues as challenges faced by my firm
Stream One	1. quality control on subcontracted processes.
	2. qualified staff training.
	3. planning of standard spare parts/devices for production.
	4. classification and condition assessment of fixtures.
	5. in-time notification of issues emerging in production.
	6. emergency inspections.
	7. localisation of customers' technical requirements.
Stream Two	8. in-time responses to customer queries and questions.
Stream Three	9. company-level personal relationship with suppliers.
Stream Four	10. review of staff benefits and official recognition of staff contributions.

4.2.2 Explanation of the key issues

Issue 1 refers to uncertainty over how subcontracted components should be monitored. For example, it was often noted too late that test reports to be issued by subcontractors.

Issue 2 in qualified staff training refers to uncertainty over how qualified staff should be developed. For example, it was known there was a short of foremen and those who might have the potential, but it was not known what and how training should be given to these candidates.

Issue 3 refers to planning of standard spare parts and devices for production refers and uncertainty over monitoring it. For example, in practice, special and expensive CNC cutters were needed from time to time, but they were often notified too late to purchase.

Issue 4 refers to that it was unclear how to ensure enough fixtures for production. For example, it was quite common that, immediately before fixtures were needed for making components, it was found there was a shortage and that it was too late to make enough.

Issue 5 concerns uncertainty over how all relevant units should be notified about issues emerging in production. For example, sometimes production engineers found that some machines stopped running due to certain issues, but nobody told them exactly what the issue was as quickly as they expected.

Issue 6 refers to how emergency inspections should be either avoided or effectively conducted. For example, just prior to every Chinese New Year holiday, emergency inspections were requested by the Quality Control Unit for almost each outbound shipment, without any improvement measures to be considered.

Issue 7 concerns uncertainty over how customer requirements on drawings should be understood by all relevant business units. For example, it was common that customer requirements in the English version were provided to the Quality Control Unit and Purchasing Unit as instructions, but they were not implemented exactly due to the difficulty for the Quality Control Unit and Purchasing Unit to read in English.

Issue 8 refers to lack of clarity on how responses to customer queries and questions should be made. For example, existing customers were from different time zones and therefore customer emails were often sent through after work. As a result, they were not replied to until the next working day although sometimes customers might expect an immediate reply.

Issue 9, refers to lack of clarity on how the Managing Director should play his role in developing a trustful relationship with suppliers. For example, quite often it was felt that with the presentation of the Managing Director, suppliers would be happy to offer more support, but it was difficult to get the Managing Director involved frequently due to the demands of his position.

Issue 10 on staff benefits and recognition refers to lack of clarity on how staff benefits should be reviewed and how recognition made. For example, it was agreed that staff contributions should be recognised and rewarded, but in practice there was no agreed metric.

With these key issues identified by participants, it was suggested that:

1. Participants started to own the problem as their own problem，for

example, when collecting and processing data in Step 1, participants were not active at all. However, in this SSM step participants were interested and active in constructing the rich picture, and immediately after the construction of the rich picture they were keen to identify the key issues existing in each of their own units. From a researcher point of view, I think such a change in behaviour of participants indicates their greater ownership of the issues.

2. There were key issues faced by firm as routine challenges in 10 aspects, which must be all sorted to make improvements in a systemic manner.

4.2.3 Researcher's reflection on progress

My firm is a friendly workplace for all staff members with different required skills to work together happily. Usually, if a customer's requirements can be completely understood, they can be transformed into either quality products or services as expected by the customer. So I am confident that the firm's technical capability is sufficient to satisfy general technical requirements by multiple customers.

However, at the time when the 10 key issues were identified as the challenges faced by the firm, it was very difficult for me to see the evidence that staff members' jobs in the firm were allocated in an official and definite manner, as it should be in business practice. Consequently, just like what happened before, it would be very difficult for customers' requirements to go through operating procedures smoothly. Job allocation of staff members was thus identified as a part of the main theme.

The Rich Picture also indicated that the Chief Engineer was over-empowered and almost every business unit had to depend on him for keeping routine operations activities running as smoothly as expected. Consequently, staff members might lose independence or even the ability to fulfil routine tasks themselves, so it would be very difficult for customers' requirements to be satisfied successfully and sustainably. As a result, empowerment of staff members was identified as another part of the main theme.

With these ideas in mind, I had a talk with the Managing Director, the Chief Engineer and the Sales Manager and expressed to them what I found from both the 10 key issues and the Rich Picture. It was immediately agreed between us that the process to transform customer requirements into products and services should also be regarded as the process of job allocation and empowerment of staff members. As long as the

process of job allocation and empowerment of staff members could be kept effective, customers' requirements would be consistently satisfied over the long term. However, it was also as agreed by everyone that it was obvious that job allocation and empowerment of staff members was not functioning properly, and the Chief Engineer stated that he wanted somebody else to share his burden.

As a result, it was collectively agreed that in continuing the SSM process, job allocation and empowerment of staff members to transform customer requirements into products and services should be identified as the critical theme.

4.3 Root definition of the relevant system (Step 3 of 7 of SSM)

In this section, it reports how root definition was developed in the sub-sections, with the root definition and CATWOE finalized for continuing my SSM work.

4.3.1 The purpose of Step 3

In the SSM process, moving from Step 2 to Step 3 means the move from the real world as represented by the Rich Picture to the abstract world of systems thinking, which, according to Checkland and Scholes (1990), is represented by the root definition of relevant systems, as the key component of Step 3. Wells (1995) states that a root definition expresses the core intention of a system of purposeful activities to be performed.

According to Checkland and Scholes (1990), to directly inform the construction of the root definition, another key component – CATWOE – must be clearly stated with this step. CATWOE stands for:

1. *Customers* to benefit from transformation made by the system.

2. *Actors* to perform human activities of the system to enact transformation.

3. *Transformation* to be made by the system.

4. *Weltanschauung* (world view) that makes the transformation meaningful.

5. *Owners* of the system.

6. *Environmental* constraints that limit what might be done as human activities. As informed by Stacey (2011), business organizations are

actually complex adaptive systems. In order to survive, organizations must keep adative to effects as the limitation from key stakehouder in business environmenet. In my case, in order to survive, we need mainly to adapt to changing expectations from customers and suppliers; as well as adapting to changing strategies of our competitors. So, in my case, possible environmental limitations might be what costumers, suppliers and competitors want or don't want us to do.

In my case, with this step, I aimed to identify the transformation process of the system of purposeful activities to be formed later, then construct the CATWOE and finally construct the root definition relevant to the system for the SSM process.

4.3.2   The identification of the transformation process

Usually, the firm does not design any products at all; they are designed by our customers. Typical requirements from customers are new drawings for quotations and samples and purchase orders for manufacture. The process to transfer customer requirements into products or services is:

1. Immediately after we have received enquiries with new drawings from customers, we make quotations for customers and samples as per customers' drawings.

2. After customers have approved the sample products, purchase orders are then placed.

3. The firm organises production to make the products exactly the same as the approved sample products.

4. Deliveries are made to customers in time as specified on the purchase orders.

However, as reflected by the Chief Engineer, it is quite common that products ordered by customers are made different from the approved sample products, or it is difficult to organise the routine manufacture process as smoothly as the sample-making process. Consequently, either incorrect products are delivered to customers, or correct products are delivered to customers later than required. This invariably results in customer complaints and risks an adverse impact on future orders.

This indicates that the repeatability of the transition flow from manufacture of sample products to routine manufacture has been unsatisfactory. To ensure that products may be always made and delivered in time in accordance with requirements of the customers, the transition flow from the manufacture of sample products to routine

manufacture must be made and kept repeatable. This was identified by me as the critical transformation process and confirmed and welcomed by all participants. The input and output for this transformation process were identified as:

1. Input: existing transition flow from manufacture of sample products to routine manufacture, which was not repeatable.

2. Output: a repeatable transition flow from manufacture of sample products to routine manufacture in future.

According to Step 2 of the SSM, the process to transform customer requirements into products and services should also be regarded as the process of job allocation of empowerment of staff members in the firm, which was identified as the theme for continuing the SSM process. With the systems thinking stages of the SSM methodology, the transformation process of making and keeping the transition flow from the manufacture of sample products to routine manufacture repeatable would be ensured by job allocation and empowerment of staff members.

4.3.3 The construction of the CATWOE

All participants were also involved in the discussion of the elements of the CATWOE. It was confirmed that:

1. Customers. It was agreed that this system was for ensuring products ordered by customers could always be made and delivered in time in future. So it should be customers who would place purchase orders to the firm in future who would immediately benefit from the system.

2. Actors. It was agreed that it would be empowered staff members to perform human activities in different positions, as formally allocated, in the transformation process of the system, to make the transformation. So, it should be empowered staff members that play the role of actors of the system.

3. Transformation. The input of the transformation process would be the existing transition flow from manufacture of sample products to routine manufacture, and output would be a repeatable transition flow from the manufacture of sample products to routine manufacture. The transformation to be made by the system should be from the existing transition flow to a repeatable transition flow.

4. *Weltanschauung.* With regard to the world view that makes the transformation meaningful, it was believed that if our firm was able to deliver the correct products to customers in time in a repeatable manner, sooner or later we would be able to achieve and sustain a

competitive supplier status with multiple customers.

5. Owner. It was agreed that it should be the senior management which had the power to decide when to start or stop the transformation of the system, and so the system should be owned by the senior management of the firm.

6. Environmental constaints. It was agreed that all human activities for the system should be performed in response to what customers, suppliers and competitors would expect the firm to do.

The CATWOE for the SSM process was summarised by me with a collective confirmation by all participants as shown in Table 7.

Table 7 - CATWOE

Customers: customers placing purchase orders to the firm.
Actors: empowered staff members of the firm.
Transformation: existing transition flow between manufacture of sample products and routine manufacture → a repeatable transition flow between manufacture of sample products and routine manufacture.
Weltanschauung: the belief that being able to repeatedly deliver correct products to customers in time as expected by customers should be the effective way to achieve and sustain a competitive supplier status with multiple customers.
Owners: the senior management of the firm.
Environmental constraints: limitations from customers, suppliers and competitors of the firm that limit what the firm do as the human activities.

4.3.4   Construction of the root definition

As defined by Bowen and Schehata (2001), there are two types of root definitions for SSM:

1. Primary task root definition, concerning the process to be engaged by organisations with regular activities for a routine purpose. With such a root definition, a system is constructed with human activities against challenges faced by organisations as routine tasks. Human activities of such a system are performed repeatedly in routine business operations.

2. Issue-based root definition, concerning process of one-off activities against key issues identified from the Rich Picture. With such a root definition, a system is constructed with human activities for sorting all target issues at one time. Human activities of such a system are not performed repeatedly in routine business operations; instead, the system is closed immediately after all target issues have been sorted.

In my project, the 10 key issues identified collectively in Step 2 of the SSM process by all participants as the challenges faced by the firm, and this suggested that an issue-based root definition with one-off occurrence of activities might be constructed against these issues.

However, these 10 issues existed in forms of routine challenges in dealing with all customers, so they would never be solved by one-off activities. Accordingly, I thought they should be deemed as primary tasks for the firm to process in routine business operations, through effective job allocation and empowerment of staff members in a formal and routine manner. In Step 2 of the SSM process, job allocation and empowerment of staff members was identified as the theme for continuing my research, and so the root definition I needed to construct for the SSM process should be a primary task root definition.

According to Wells (1995), a root definition of systems for the SSM process is formed with three elements: what the system does, how the system does it, and why it is done. In the SSM process, these three elements were confirmed as

1. *What the system does*. According to my CATWOE, it would be a system owned by the senior management of the firm to ensure the transition flow from manufacture of sample products to routine manufacture would be repeatable.

2. *How the system does it*. According to the identification of transformation process, repeatability would be ensured by job allocation and empowerment of staff members against 10 key challenges faced by the firm in routine business operations.

3. *Why it is done*. according to my CATWOE, it was believed that the repeatability of the transition flow could effectively help the firm to achieve and sustain a competitive supplier status with multiple customers.

By articulating these three elements, the root definition for the SSM process was constructed by me and confirmed with participants as in Table 8.

Table 8 - My Root Definition

(a) A system owned by the senior management of the firm to ensure that the transition flow from manufacture of sample products to routine manufacture is repeatable, (b) by job allocation and empowerment of staff members against the 10 key challenges faced by the firm in routine business operations, (c) to achieve and sustain a competitive supplier status with multiple customers.

4.3.5   Researcher's reflection on progress

In this step of the SSM process, I was mainly thinking about how to identify the transformation process of the system, construct the CATWOE, and finally construct the root definition, although participants were also involved from time to time to confirm my thinking and to encourage them to own the problem.

With this step, participants became much more active and clearer over how this research should continue, as I engaged them to confirm my systems thinking against their business practice. Some of them even were looking forward to talking about specific activities of the system, although it was too soon do so. This meant that participants started to display their ownership of the problem, which would be important and helpful for promoting the conduct of the following steps of the SSM process.

Although this definition may briefly show the important elements, such as the ownership of the senior management and the job allocation and empowerment of staff members, more attention should be paid in the following steps to these elements for a participative research.

4.4   Conceptual Model (Step 4 of 7 of SSM)

In this section, it reports how the conceptual model was developed in the following sub-sections, with the conceptual model and a set of purposeful activities to be reorganzied and the conceptual model finalized for continuing my SSM work.

4.4.1   The purpose of Step 4

According to Platt and Warwick (1995), for an SSM process, the conceptual model of the system represents the minimum set of purposeful human activities specified in the root definition. With such a conceptual model, a comparison can be made later

between the conceptual model and the real world represented by the Rich Picture, to sort out the gap between what is being done and what should be done.

In this research, with this step, I aimed to construct a conceptual model of activities with job allocation and empowerment of staff members as the theme, along with the transition flow between sample products manufacture and routine manufacture.

As the outcome of this step, the conceptual model of the system for the SSM process was constructed, with purposeful activities and measures of performance.

4.4.2 Factors considered for my conceptual model

I argued in Chapter 2 that the problem might be solved through approaching four streams of improvements, QFD management to satisfy customers quality requirements, personal interaction with customers for constantly improving competitive advantage over competitors, trustful relationships with suppliers and staff motivation. However, being a small firm with limited human resources, instead of forming four separate teams to address these issues, I would prefer to address the problem through a systemic approach integrating all needed human activities together, although such an approach was very challenging.

Data was collected from participants during Step 1 of the SSM and the Rich Picture was constructed, and 10 key issues identified in Step 2 leading to the identification of the key theme to continue the SSM process: job allocation and empowerment of staff members in the firm.

The transition flow between sample product manufacture and routine manufacture was not repeatable, so my conceptual model should be able to present how this can be rectified by job allocation and empowerment of staff members. As informed by Checkland and Scholes (1990), an effective conceptual model should be constructed based on the consideration of a set of elements, such as environment constraints, key purposeful activities, sequence between activities, and measure of performance. In the following four paragraphs, the italic subtitles stand for considerations that would be made for forming the conceptual model of my SSM work:

Environmental constraints: as identified for forming the CATWOE articulated in Step 3

– what all customers, suppliers and competitors expect or do not expect the firm to do – should play a role in limiting what human activities should be performed for the system specified by my root definition. Thus the purposeful activities for my conceptual model should reflect not only the importance of customers' requirements, but also the influence from suppliers and competitors.

The nature of key purposeful activities: although for conceptual model purpose only a set of minimum purposeful activities should be considered, due to the complexity of the problem, each purposeful activity might be performed by several staff members from different business units in a collaborative manner. So, my conceptual model should be formed with specific activities performed by different staff members from different business units.

Logical sequence between purposeful activities: as analysed above, all purposeful activities would be performed along with the transition flow of sample products manufacture and routine manufacture for improving the repeatability of the transition flow. Purposeful activities for my conceptual model should thus be organised systematically, along with the sequence of this transition flow.

Measures of performance: as required by my firm, the performance of the transformation process must be reviewed periodically so that we know what improvements should be made in future. According to Checkland and Scholes (1990) the performance of the transformation process should be reviewed by monitoring efficacy (E1), efficiency (E2) and effectiveness (E3). In addition to the model of purposeful activities, monitors for efficacy (E1), efficiency (E2) and effectiveness (E3) of the transformation process should therefore also be of the component of my conceptual model. In my case, E1 stands for the efficacy of the recommened actions to be taken for changes, in another word whether the recommended actions help to make improvements ; E2 stands for the efficiency of the recommened actions, in another word in what extent the recommended actions may help to make improvments ; E3 stands for the significant changes perceived by customers on my organization's business performance, after recommened actions have been taken.

4.4.3 Purposeful activities and performance measures

Identification of Purposeful activities against the 10 key issues were identified in two phases.

4.4.3.1 Phase one

To ensure that a minimum set of purposeful activities could be worked out effectively, participants who were able to understand the whole process of the transition flow from different business units, including heads of all business units involved in the research, were invited to analyse and propose ideas in two areas proposed by me:

1. Which specific stages of the whole transition flow had issues to be addressed (Aspect a)?

2. Which relevant issues of the 10 key issues should be addressed in these specifically identified stages (Aspect b)?

As the contribution made by these participants, seven stages (from Stage A to Stage G) along the whole manufacture transition flow were identified with issues to be addressed, and key issues (see Table 6) were positioned in different stages.

As the outcome, target stages and relevant issues to be addressed were worked out as shown in Table 9.

Table 9 - Target stages and relevant issues to be addressed

Target Stages of Transition Flow	Relevant Issues (Table 6)
Stage A, immediately after customer enquiries have been received.	Issues related to in-time response to customer queries and questions. Keep interaction with customers in this stage.
Stage B, immediately after customers have been confirmed with the receipt of enquiries.	Issues related to localisation of customer technical requirements. Keep interaction with customers in this stage.
Stage C, before confirm customer enquiries.	Issues related to: ▷Localisation of customer technical requirements; ▷Quality control on subcontracted processes, qualified staff training; ▷Obtaining materials from suppliers, planning of standard spare parts and devices for routine production; ▷Deployment of needed labour resources. Keep interaction with customers and suppliers in this stage.
Stage D, when making sample products for customer approval.	Issues related to: ▷Localisation of customer technical requirements; ▷Recognition on staff members' actual contributions for benefits. Keep interaction with customers and an eye on competitors' activities in this stage.

Stage E, immediately after purchase orders have been received and before confirming customers for routine manufacture.	Issues related to: ▷Classification and condition assessment of fixtures; ▷Emergency inspections; ▷Subcontracted processes; ▷Obtaining materials; ▷Deployment of labour resources. Keep interaction with customers and suppliers in this stage.
Stage F, immediately after purchase orders have been confirmed and before routine manufacture starts.	Issues related to: ▷Planning of standard spare parts/devices for production; ▷Classification and condition assessment of fixtures; ▷In-time notification of issues emerging in production; ▷Quality control on subcontracted processes, qualified staff training; ▷In-time delivery of raw materials; ▷Emergence inspections. Keep interaction with customers and suppliers in this stage.
Stage G, after deliveries have been made to customers.	Issues related to the in-time response to customer queries or questions.

This showed that all 10 issues identified from the Rich Picture were positioned in relevant stages of the transition flow. Some of the issues were found multi-positioned in different target stages. It meant that we were ready to move to the next phase and work out purposeful activities needed for my conceptual model.

4.4.3.2 Phase two

immediately after target stages and relevant issues to be addressed had been positioned in the whole transition flow of manufacture, a meeting involving all participants was held to collectively analyse and finalise the purposeful activities to be taken against the issues to be addressed in each target stage. In this meeting, purposeful activities were analysed in a collaborative manner to ensure all the concerns and views of each participant were seriously considered and articulated together.

According to Stacey (2011), a business organisation is regarded as an adaptive system in a business environment. To survive, the organisation should keep its management activities adaptive to the effects from the business environment. In my research, to ensure that all needed activities would be organised in an adaptive manner, when purposeful activities were being discussed by all participants, environmental constraints defined by my CATWOE were also seriously considered.

As the outcome of this meeting, needed purposeful activities for my conceptual model

were finalised as shown in Table 10.

Table 10 - Target stages and purposeful activities

Target Stages in Transition Flow	Purposeful Activities
Stage A, immediately after customer enquiries have been received.	Confirm customers the receipt of enquiries and timescale of making quotes, by involving empowered staff members, against issues related to in-time response to customer queries and questions. Keep interaction with customers in this stage.
Stage B, immediately after customers have been confirmed with the receipt of enquiries.	Interpret customer drawings and translate into local business language officially and collectively, by involving empowered and qualified staff members, against issues related to localisation of customer technical requirements. Keep interaction with customers in this stage.
Stage C, before confirm customer enquiries.	Analyse manufacturability collectively for routine manufacture in future, by involving empowered internal stakeholders, against issues related to localisation of customer technical requirements, quality control on subcontracted processes, qualified staff training, obtaining materials from suppliers, planning of standard spare parts and devices for routine production, and deployment of needed labour resources. Keep interaction with customers and suppliers in this stage.
Stage D, when making sample products for customer approval.	Convert translated customer drawings collectively into fully readable documented production and inspection instructions, by involving empowered staff members, against issues related to localisation of customer technical requirements and recognition on staff members' actual contributions for benefits. Keep interaction with customers and an eye on competitors' activities in this stage.
Stage E, immediately after purchase orders have been received and before confirming customers for routine manufacture.	Analyse deliverability collectively, by involving empowered staff members, against issues related to classification and condition assessment of fixtures, emergency inspections, subcontracted processes, obtaining materials and deployment of labour resources. Keep interaction with customers and suppliers in this stage.
Stage F, immediately after purchase orders have been confirmed and before routine manufacture starts.	Make preparation plan collectively for smooth production, by involving empowered staff members, against issues related to planning of standard spare parts/devices for production, classification and condition assessment of fixtures, in-time notification of issues emerging in production, quality control on subcontracted processes, qualified staff training, in-time delivery of raw materials and emergence inspections. Keep interaction with customers and suppliers in this stage.
Stage G, after deliveries have been made to customers.	Keep in touch closely with customers over the quality state of the delivered products, by involving empowered staff members, against issues related to the in-time response to customer queries or questions.

With this outcome, all purposeful activities of job allocation and empowerment of

staff members were defined against the 10 issues multi-positioned in target stages of the transition flow from sample products manufacture to routine manufacture. Although specific staff members to be involved as internal stakeholders or dedicated persons in job allocation and empowerment were not yet confirmed, they had their places in this table already.

Immediately after the key purposeful activities of job allocation and empowerment of staff members had been defined, the question of how to measure the performance of the transformation process in terms of efficacy (**E1**), efficiency (**E2**) and effectiveness (**E3**) were addressed.

As defined in the CATWOE, the modelled system would be owned by the senior management. So, the Managing Director and the Chief Engineer as the senior managers, and the Sales Manager as a key stakeholder, were involved to discuss how the three Es should be defined. This discussed was conducted in a collaborative manner to ensure all concerns and views of each participant were considered. The suggestions made were:

1. For E1 (efficacy), it was agreed that we should focus on whether fewer delayed or rejected delivery batches to customers could be made.

3. For E2 (efficiency), it was agreed that we should focus on numbers of delayed and rejected delivery batches to customers that could be reduced.

4. For E3 (effectiveness), it was agreed that we should focus on customer satisfaction with our improvements in timely and accepted deliveries.

The results are presented in Table 11.

Table 11 - Performance measures

E1 (efficacy)	Do we have fewer delayed or rejected delivery batches to customers per month than before?
E2 (efficiency)	How many delayed or rejected delivery batches to customers are less than the month before?
E3 (effectiveness)	Are customers satisfied by the improvement of our performance in on-time and accepted deliveries.

It was also agreed that in future performance would be reviewed by a team of the Managing Director, the Chief Engineer, the Sales Manager and myself.

4.4.4　The conceptual model of the SSM process

A meeting was held involving all participants to draw up the conceptual model with me. With the transition follow between sample products manufacture and routine manufacture as the logical sequence, all the key purposeful activities and measures of performance were collectively linked and formed into the conceptual model in Figure 3.
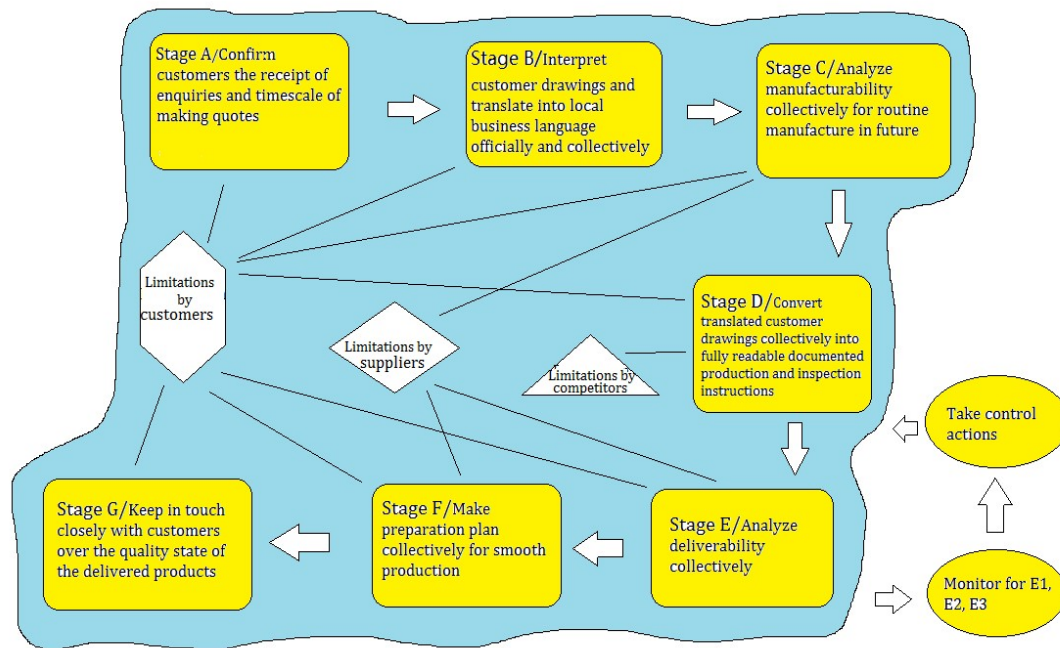
Figure 3 - The Conceptual Model

This conceptual model represents how the idealised system transforms the existing transition into a repeatable transition flow, from sample products manufacture to routine manufacture, would perform with a set of purposeful activities of job allocation and empowerment of staff members.

Firstly, stage numbers from A to G shadowed in the seven yellow rectangles stand for the target stages in the transition flow from sample product manufacture to routine manufacture, for which purposeful activities need to be organised against specific issues identified in earlier sections. The statements of activities also shadowed in the rectangles stand for specific purposeful activities to be performed along each target stage of transit flow.

Secondly, the arrows linking the seven yellow rectangles stand for the sequence of the

transit flow. It indicates that all purposeful activities of job allocation and empowerment of staff members will be performed in sequence.

Thirdly, with statement of limitations from customers, suppliers and competitors shadowed in white shape zones and linked with specific rectangles, it shows that all purposeful activities were defined and will be performed in an adaptive manner to these limitations as the environment constraints.

Fourthly, the statements shadowed in the two yellow ovals and the arrows linking both the ovals and the modelled system indicate that this system is owned by the senior management, and the performance of this system will also be monitored by the senior management with measures as defined by E1, E2 and E3.

Fifthly, as a summary, the modelled system for the SSM process was not designed as a dedicated one-off system for sorting temporary issues; instead, this model was designed as a permanent system for dealing with challenges faced by the firm as routine tasks from two aspects:

1. The manufacture of existing products will be reviewed through going through this system to ensure that routine manufacture in future is organised in a repeatable manner. This repeatability will be reviewed periodically with this system for continuous improvements.

2. For future new products, the development of each will go through this system from the very beginning to ensure that the whole transit flow starts in a repeatable manner.

4.4.5   Researcher's reflection on progress

From the conceptual model constructed with this step, it could be said that all human activities would be organised with all effects from customers, suppliers and competitors as the centre. This was very different from the situation reflected in the Rich Picture, where effects from environment constraints, especially suppliers and competitors, were not regarded as important. Actually, when in the process of constructing this conceptual model, participants were excited and looking forward to knowing how they would play their roles in this system, although it was still too early to define that with this step.

These findings meant that participants had not only owned the problem, but were

looking forward to making changes. With participants' solid supports, it was really good for continuing my research although it might be too early to identify changes to be made later and so when making comparison between this conceptual model and the real world in the next step of the SSM process, more attention should be paid to remind participants to focus on reality and feasibility of improvements.

4.5 Comparison between the conceptual model and the real world (Step 5 of 7 of SSM)

In this section, it reports how the conceptual model was compared with the real world (the rich picture) in the following sub-sections, with gaps between the conceptual model and the real world identified, and comments and recommendations of improvements made.

4.5.1 The purpose of Step 5

According to Bowen and Shehata (2001), the purpose of step 5 of SSM is to compare the constructed conceptual model (Figure 3) and the real world represented by the Rich Picture (Figure 2) constructed in Step 2, so that both similarities and differences between these different worlds may be worked out for the identification of gaps. The comparison between the model of purposeful activities and the real world for the firm is very important for us to spot activities which are satisfactorily done, partially done, poorly done or which are not done at all, so that comments on actual performance can be made.

The outcome of this step will be not only how the gaps between the conceptual model and the real world was identified, but also how comments and recommendations of improvements were made.

4.5.2 Comparison

To organise the comparison effectively, I proposed a draft form (see Appendix 3) listing all the purposeful human activities forming the modelled system finalised in Step 4, and set up a workshop involving all participants to compare the conceptual model formed in Step 4 and the Rich Picture constructed with Step 2 to confirm which activities were being done satisfactorily done, poorly done or not done at all. During this workshop, each participant had a copy of the draft form. It was collectively agreed

that we should fill this form following target stages from A to G one by one, so that all participants could focus on relevant activities for one target stage at a time. All participants were reminded to keep themselves in the real world and think what activities were being performed for each target stage of the transit flow. Statements about the real world were to be confirmed by all participants before I filled in the form. Secondly, participants were asked to collectively compare purposeful activities defined by the conceptual model and activities being performed in the real world, to work out the gap. Statement of the gap was confirmed by all participants before being put on the form by me.

Finally, when the gap for each target stage was collectively confirmed, participants were asked to think what comments and recommendations they wanted to make for filling the identified gap. Statements of the comments and recommendations made by participants were all confirmed by all participants before being put on the form by me. The outcome is shown in Table 12.

Table 12 - Comparison between conceptual model and real world

Target Stage of TransitionFlow	Purposeful Activities	Real World	Gap	Comments and Recommendations
Stage A, immediately after customer enquiries have been received:	Involve dedicated persons to confirm customers the receipt of enquiries and timescale to make quotes, against potential issues related. Keep interaction with customers in this stage.	Business representatives are dedicated persons to confirm customer enquiries. But, sometimes the receipt of enquires from certain customers are not confirmed at all.	Partially done.	Without an immediate confirmation of the receipt of enquired, customers are not sure whether their enquires have been received or not. Competitors' immediate response might take the business. Changes must be made to improve this situation.
Stage B, immediately after customers have been confirmed with the receipt of enquiries:	Involve and empower qualified persons to collectively interpret customer drawings exactly and translate into local business language officially and completely, against potential issues related to localisation of customer technical requirements. Keep interaction with	Business representatives are dedicated persons for translating customer drawings themselves and ask relevant manufacturing engineers only when they have questions.	Partially done by representatives.	Due to the lack of relevant knowledge and experiences, Business Representatives sometimes incorrectly or incompletely interpret technical requirements on customer drawings, which leads to wrong actions taken by engineers later. Changes must be made to avoid incorrect interpretation to customer drawings.

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	customers in this stage.			
Stage C,before confirming customer enquiries:	Involve and empower internal stakeholders to collectively analyse manufacturability for routine manufacture in future, against potential issues related to localisation of customer technical requirements, quality control on subcontracted processes, qualified staff training, obtaining materials from suppliers, planning of standard spare parts and devices for routine production, and deployment of needed labour resources. Keep interaction with customers and suppliers in this stage.	Usually the chief engineer makes decisions himself for making sample products.	Not done at all.	Without such an analysis, it is sometimes found that routine manufacture cannot be organised at all for initial orders immediately after the approval of sample products, which are made through a special approach merely for sample production purpose. Changes must be made to avoid such issues.
Stage D,when making sample products for customer approval:	Involve and empower internal stakeholders to collectively convert translated customer drawings into fully readable documented production and inspection instructions, against potential issues related to localisation of customer technical requirements and recognition on staff members' actual contributions for benefits. Keep interaction with customers and an eye on competitors' activities in this stage.	Usually the chief engineer orally instructs relevant staff to product and check sample products.	Not done at all.	Without the formal readable documents converted from customer drawings to instruct the production and inspection, incorrect sample products sometimes are made and delivered to customers, and contributions to be made by staff in future cannot be correctly measured. Changes must be made to avoid incorrect sample products.
Stage E, immediately after purchase orders have been	Involve and empower internal stakeholders to collectively analyse the deliverability, against potential issues related to classification	Usually the deliverability of new orders is collectively assessed with the consideration of	Partially done.	Without the immediate classification and condition assessment of fixtures, production plans have to be rescheduled again and again due to the short of valid

received and before confirming customers for routine manufacture:	and condition assessment of fixtures, emergency inspections, subcontracted processes, obtaining materials and deployment of labour resources. Keep interaction with customers and suppliers in this stage.	emergency inspections, subcontracted processes, obtaining materials and deployment of labour resources. But, in most cases the classification and condition assessment of fixtures are not made immediately.		fixtures. Changes must be made to avoid such issues.
Stage F, immediately after purchase orders have been confirmed and before routine manufacture starts:	Involve and empower internal stakeholders to collectively make preparation plan for smooth production, against potential issues related to planning of standard spare parts/devices for production, classification and condition assessment of fixtures, in-time notification of issues emerging in production, quality control on subcontracted processes, qualified staff training, in-time delivery of raw materials and emergence inspections. Keep interaction with customers and suppliers in this stage.	Usually preparation plans for productions s are collectively made with the consideration of standard spare parts/devices for production, classification and condition assessment of fixtures, quality control on subcontracted processes, in-time delivery of raw materials and emergence inspections. But, in most cases, staff training and in-time notification of issues to emerge in production are not considered at all.	Partially done.	With the short of fully trained staff and the in-time notification of issues emerging in production, productions have to be interrupted sometimes, emergency inspections have to be conducted and deliveries to customers have to be delayed. Changes must be made to avoid such issues.
Stage G,after deliveries have been made to customers:	Involve dedicated persons to keep in touch closely with customers over the quality state of the delivered products, against potential issues related to the in-time response to customer queries or questions.	Business representative are dedicated persons but only occasionally ask customers about the quality status of delivered products in their own initiatives.	Poorly done.	In most cases, nobody is sure about the actual quality status of the delivered products, and immediate actions are not able to be taken in time against potential quality issues.

With the formal comparison form completed as the outcome of this step, we are ready to enter Step 6 of the SSM process.

4.6 Feasible and desirable changes to be made (Step 6 of 7 of SSM)

In this section, it reports in the following sub-sections how feasible and desirable changes were finalised based on the comparison form completed in Step 5.

4.6.1 Purpose of this step

According to Checkland and Scholes (1990), step 6 of 7 of SSM is for identifying feasible and desirable changes to be implemented. The outcome of this step will be how feasible and desirable changes were finalised, based on the comparison form completed in Step 5.

4.6.2 Factors considered

According to Wells (1995), changes may be made in three areas: structure, processes and attitudes. From the collected data and discussions with participants, both the gaps identified, and recommendations made in Step 5 indicate that a variety of specific issues were identified from all these three areas, so the changes to be made in my firm should include all three.

As stressed by Land (1994), it should be feasible and desirable changes that are proposed so that all desirable changes may be fully discussed, and an agreement reached with all participants for effective implementation. In my case, any changes to be proposed should not only desirable, but feasible for the firm.

As expected by the Managing Director, a table of desirable changes is important for him to refer to before he approves the action plan later.

4.6.3 Proposal of both feasible and desirable changes

A discussion involving all participants was organised based on the formal comparison form completed in Step 5, to identify what desirable and feasible changes could be made. In this discussion, not only changes were considered, but also how particular jobs would be allocated and performed by relevant staff members.

After the agreement reached by all participants after this discussion, a formal form was filled in by me and confirmed by all participants as shown in Table 13.

Table 13 - Desirable and feasible changes

Target Stage of Transition Flow	Desirable and Feasible Changes	Staff Members Needed to Make the Changes
A. Immediately after customer enquiries have been received:	The receipt of each customer enquiry must be confirmed back to relevant customer within 2 hours of the receipt by dedicated persons.	Business representatives act as the dedicated persons to keep in touch with customers.
		To be performed routinely.
B. Immediately after customers have been confirmed with the receipt of enquiries:	Before any customer drawings are translated into local business language, relevant dedicated persons must involve relevant manufacturing engineers to read and interpret drawings with them. The interpretation of customer technical requirements must be agreed by relevant manufacturing engineers before translated into local business language. Keep in touch with customers when needed.	Business representatives act as the dedicated persons to translate drawings and keep in touch with customers, with the assistance of relevant manufacturing engineers.
		To be performed routinely.
C. Before confirming customer enquiries:	For each enquired product, manufacturability for routine manufacture in future must be analysed against potential issues related to localisation of customer technical requirements, quality control on subcontracted processes, qualified staff training, obtaining materials from suppliers, planning of standard spare parts and devices for routine production, and deployment of needed labour resources. Keep in touch with customers when needed.	Manufacturing engineers for analysing localisation of customer technical requirements, deployment of labour resources and needed standard parts. Quality engineers for analysing subcontracted processes and needed inspection devices. The Chief Engineer for analysing the training of qualified staff members. Purchasing Manager for analysing obtaining materials. Business representatives as the dedicated persons to keep in touch with customer when needed.
		To be performed routinely.
D. When making sample products for customer approval:	All customer drawings must be converted into fully readable documents for instructing production and inspection as sample products are made to prevent potential issues related with localisation of customer technical requirements and recognition on staff members' actual contributions for benefits. Keep in touch with customers and keep an eye on competitor's actions.	The Chief Engineer acts as the dedicated person for converted all customer drawings into fully readable documents for production and inspection, and evaluating staff members' actual contributions for benefits. Business representatives act as the dedicated persons to keep in touch with customers when needed, and keep an eye on competitors' actions.
E. Immediately after purchase orders have been received	In addition to the factors considered for analysing the deliverability of purchase orders placed from customers for routine manufacture, needed fixtures must be classified and the condition must be	Workshop managers to classify and assess the condition of needed fixtures. Business representatives keep in touch with customers when

and before confirming customers for routine manufacture:	assessed. Keep in touch with customers when needed.	needed.
		To be performed routinely.
F. Immediately after purchase orders have been confirmed and before routine manufacture starts:	In addition to factors considered for preparing smooth productions, needed staff training plan and notification measures against potential issues to be emerging in productions must also be considered and under control. Keep in touch with customers when needed.	The Chief Engineer acts for planning needed staff training. Inspectors to check half finished products periodically. Workshop managers collect reports of issues emerging from staff members on workshop floors. Business representatives keep in touch with customers when needed.
		To be performed routinely.
G. After deliveries have been made to customers:	Dedicated persons must keep in touch with customers and ask about the quality status of each delivery batch.	Business representatives act as the dedicated persons.
		To be performed routinely.

4.6.4   Researcher reflection on progress

The discussion for this step was conducted much more smoothly than I had originally expected, and I thought there would be a lot of debate and argument between participants. However, in reality, participants reached all agreements with each other rather quick in a very friendly manner.

The relevant staff members were identified to perform the changes routinely, and this might mean that participants were ready and had the enthusiasm to be involved in making these needed changes every day. However, such enthusiasm might be upset over time if staff members were not treated as the actors, and so the action plan would have to pay attention to how these staff members' roles were formalised.

4.7   Evaluation of feasibility and action plan (Step 7 of 7 of SSM)

In this section, it reports in the following sections how the feasibility of the desired changes were evaluated, with the formal action plan for my organization as the outcome.

4.7.1 The purpose of step 7

According to Checkland and Scholes (1990) the final step of an SSM project is concerned with the implementation of the changes so that the problem can be addressed through the proposed actions. Following the agreement made between my Managing Director and me, rather than immediately implementing the proposed changes, evaluation of their feasibility was to be made for both business practice and research purposes, so that potential issues in the process of implementation could be found and addressed as early as possible.

The outcome of this step it will be the evaluation of the feasibility of actions, and an action plan.

4.7.2 Evaluation on feasibility of implementation of the changes

Immediately after the completion of Step 6, a meeting was held between my Managing Director and me, focusing on reviewing the proposed changes and actions, and discussing how the implementation of the proposed changes might be successfully made in the firm. As the Managing Director was one of the participants in the SSM project and had witnessed how these changes were proposed, he thought it was quite promising to make improvements effectively if the proposed changes could be implemented in business practice.

However, he observed that, even though relevant staff members and how they should perform the proposed changes had all been defined, it was still not clear how the routinisation of each staff member's performance would be ensured in practice. He thought these changes could still not be directly achieved, and to effectively implement them some preliminary work should be done. As a result, it was agreed that a further meeting should be held to discuss what form this preliminary work should take.

4.7.2.1 Proposed preliminary work

After the agreement between my Managing Director and me, a further meeting was held involving managers from all business units, who were also all participants of the SSM project, to collectively discuss what preliminary work should be undertaken. At this meeting, it was collectively agreed that, to have every staff member's

responsibilities formalised, job allocation and empowerment must be officially made for all staff members affected by the proposed changes, through revising each staff member's job specification.

4.7.3 The action plan

At the same meeting, it was also collectively agreed that, immediately after the revision of all staff members' job specifications had been completed and approved, they should immediately play their roles for the proposed changes. As the outcome of this meeting, the formal action plan for implementing the proposed changes was established, and is shown in Table 14.

Table 14 - The action plan

Proposed Desirable and Feasible Changes	Staff Members to Perform as the Actors	Lead for the Revision of Staff Members' Job Specifications	Deadline of completion	Start Date of Actions for Changes
Part A The receipt of each customer enquiry must be confirmed back to relevant customer within 2 hours of the receipt by dedicated persons.	*Business representatives* act as the dedicated persons to keep in touch with customers.	Sales Manager	15th July 2016	1st August 2016
Part B Before any customer drawings are translated into local business language, relevant dedicated persons must involve relevant manufacturing engineers to read and interpret drawings with them. The interpretation of customer technical requirements must be agreed by relevant manufacturing engineers before translated into local business language. Keep in touch with customers when needed.	*Business representatives* act as the dedicated persons to translate drawings and keep in touch with customers.	Sales Manager	15th July 2016	1st August 2016
	Manufacturing engineers to confirm the interpretation of customer technical requirements for Business Representatives.	The Chief Engineer.		

Part C For each enquired product, manufacturability for routine manufacture in future must be analysed against potential issues related to localisation of customer technical requirements, quality control on subcontracted processes, qualified staff training, obtaining materials from suppliers, planning of standard spare parts and devices for routine production, and deployment of needed labour resources. Keep in touch with customers when needed.	*Manufacturing engineers* for analysing localisation of customer technical requirements, deployment of labour resources and needed standard parts.	The Chief Engineer.	15th July 2016	1st August 2016
	Quality engineers for analysing subcontracted processes and needed inspection devices.	Quality Manager		
	The Chief Engineer for analysing the training of qualified staff members.	Managing Director		
	Purchasing Manager for analysing obtaining materials.	Managing Director		
	Business representatives as the dedicated persons to keep in touch with customer when needed.	Sales Manager		
Part D All customer drawings be converted into fully readable documents for instructing production and inspection as sample products are made to prevent potential issues related with localisation of customer technical requirements and recognition on staff members' actual contributions for benefits. Keep in touch with customers and keep an eye on competitor's actions.	*The Chief Engineer* acts as the dedicated person for converted all customer drawings into fully readable documents for production and inspection, and measuring staff members' actual contributions.	Managing Director	15th July 2016	1st August 2016
	Business representatives act as the dedicated persons to keep in touch with customers when needed, and keep an eye on competitors' actions.	Sales Manager		
Part E In addition to the factors considered for analysing the	*Workshop managers* to classify and assess the condition of needed fixtures.	The Chief Engineer	15th July 2016	1st August 2016

Part C For each enquired product, manufacturability for routine manufacture in future must be analysed against potential issues related to localisation of customer technical requirements, quality control on subcontracted processes, qualified staff training, obtaining materials from suppliers, planning of standard spare parts and devices for routine production, and deployment of needed labour resources. Keep in touch with customers when needed.	*Manufacturing engineers* for analysing localisation of customer technical requirements, deployment of labour resources and needed standard parts.	The Chief Engineer.	15th July 2016	1st August 2016
	Quality engineers for analysing subcontracted processes and needed inspection devices.	Quality Manager		
	The Chief Engineer for analysing the training of qualified staff members.	Managing Director		
	Purchasing Manager for analysing obtaining materials.	Managing Director		
	Business representatives as the dedicated persons to keep in touch with customer when needed.	Sales Manager		
Part D All customer drawings be converted into fully readable documents for instructing production and inspection as sample products are made to prevent potential issues related with localisation of customer technical requirements and recognition on staff members' actual contributions for benefits. Keep in touch with customers and keep an eye on competitor's actions.	*The Chief Engineer* acts as the dedicated person for converted all customer drawings into fully readable documents for production and inspection, and measuring staff members' actual contributions.	Managing Director	15th July 2016	1st August 2016
	Business representatives act as the dedicated persons to keep in touch with customers when needed, and keep an eye on competitors' actions.	Sales Manager		
Part E In addition to the factors considered for analysing the	*Workshop managers* to classify and assess the condition of needed fixtures.	The Chief Engineer	15th July 2016	1st August 2016

deliverability of purchase orders placed from customers for routine manufacture, needed fixtures must be classified and the condition must be assessed. Keep in touch with customers when needed.	**Business representatives** keep in touch with customers when needed.	Sales Manager			
Part F In addition to factors considered for preparing smooth productions, needed staff training plan and notification measures against potential issues to be emerging in productions must also be considered and under control. Keep in touch with customers when needed.	**The Chief Engineer** acts for planning needed staff training.	Managing Director	15th July 2016	1st August 2016	
	Inspectors to check half finished products periodically.	Qualify Manager			
	Workshop managers collect reports of issues emerging from staff members on workshop floors.	The Chief Engineer			
	Business representatives keep in touch with customers when needed.	Sales Manager			
Part G Dedicated persons must keep in touch with customers and ask about the quality status of each delivery batch.	**Business representatives** act as the dedicated persons.	Sales Manager	15th July 2016	1st August 2016	

Immediately after this formal action plan was proposed to the Managing Director, he expressed his satisfaction with it and agreed that it should be implemented immediately and as planned. To measure the performance of the conceptual model of the SSM project, he also agreed that performance measures of E1, E2 and E3, defined in Step 4 of the SSM process, would be reviewed after all proposed changes had been in place for at least six months.

4.7.4 Researcher's reflection on progress

Step 7 the SSM ended with a formal action plan. With this plan, all expected outcomes were produced, including proposed changes in form of human activities and relevant

staff members for performing these changes. With the implementation of these changes in the firm, I would expect that the existing transition flow from sample products manufacture to routine manufacture could become highly repeatable, so that a competitive supplier status would be earned from multiple customers.

In business practice, actions for implementing the proposed changes will be taken and reviewed periodically. However, time constraints for the DBA thesis process did not allow full implementation to be completed in time for the writing of this thesis.

Chapter 5. Discussion of the Progress against Research Objectives

The overall objective of this DBA project was to identify firm-wide management activities and implement actions to realise my firm's strategic goal to make a sustainable change from a low-end supplier to being recognised as having a high-end status. As sub-objectives, four areas of operational improvment were identified in discussions with the Board: (1) exactly achieving customers' quality requirements; (2) becoming a more competitive supplier for target customers; (3) improving relationship with our suppliers; and (4) motivating employees for better performance. I conducted a literature review related to these four areas that suggested improvement practices in each. However the limited resources of our small firm mean it is not possible to simply implement four sets of improvement activities (one in each area). As a consequence a key methodological challenge for this DBA research was to integrate four areas on improvement activity in a systemic manner. This requirement was met by adoting the soft systems methodology (Checkland and Howell, 1993). For my thesis project , I started my research from May 2014, finished the SSM activities in June 2016. I reviewed progress towards desired changes following the recommended actions for six months from 1st August 2016 to 31st January 2017.

In this chapter I discuss the progress made during the research in achieving each of the four sub-objectives. The chapter explains the actionable knowledge sought and the key actions recommended in the SSM work for making improvements, evaluates the actions after having been taken for six months, and compares the effect with ideas from the literature review (see Chapter 2)

5.1 Objective 1 – Exactly achieving customers' quality requirements

In the SSM work, achieving customers' quality requirements was set as objective 1. It was expected that after the organisational and operational situation of the problem had been understood, desired changes could be proposed, and actions may be recommended for implementing the desired changes and improving the firm's capability in term of satisfying customer's quality requirements.

In this section, it reports in the following sub-sections the statements of the actionable

knowledge towards Objective 1, and the the progress against Objective 1 after recommended actions have been taken for the first 6 months, and has the actual effect compared with ideas from reviewed literature.

5.1.1 The actionable knowledge

In the SSM work, as the understanding of the organisational and operational situation of the problem, it was found in business practice that:

1. Technical requirements on customer drawings were sometimes incorrectly or incompletely interpreted, leading to wrong actions by engineers. Changes should be made to ensure that all customer drawings were exactly understood.

2. Before confirming customer enquiries, there was no manufacturability analysis. Consequently, routine manufacture sometimes could not be organised for initial orders quickly after the approval of sample products. Changes should be made to ensure that all potential issues that could emerge in routine manufacture would be considered before confirming customer enquiries.

3. When making sample products for customer approval, there were no formal readable documents converted from customer drawings, for informing the production and inspection. Consequently, incorrect sample products were sometimes made and delivered to customers. Changes should be made to ensure that all production and inspection is guided clearly and correctly.

4. Immediately after the receipt of purchase orders for routine manufacture and before replying to customers with a confirmed purchase order, there were no immediate classification and condition assessments of fixtures. Consequently, sometimes production plans had to be rescheduled due to the shortage of valid fixtures. Changes should be made to ensure that all needed valid fixtures could be in place in time before production.

5. Immediately after purchase orders had been confirmed and before routine manufacture started, there was often a shortage of trained operators and timely notification of possible issues in production. Consequently, production sometimes had to be interrupted, emergency inspections had to be organised, and deliveries to customers had to be delayed. Changes should be made to ensure that all required staff are fully trained in time and notifications of all potential issues in production are made in advance.

5.1.2 Actions recommended for changes

To make desired improvements with changes to be implemented against the above

findings, in the SSM work actions were recommended for desired changes as stated below:

1. Immediately after the receipt of customer enquiries, customer drawings must be translated into the local business language, with Business Representatives and manufacturing engineers working together as the key actors. It was expected that, with the recommended actions having been taken, all customer technical requirements would be exactly understood in the firm.

2. Before confirming customer enquiries, for each product the manufacturability must be analysed with the Chief Engineer, manufacturing engineers, quality engineers and Purchasing Manger working together as the key actors. It was expected that, with the recommended actions having been taken, all difficulties or issues in routine manufacture could be considered in advance, so that customer enquiries could be confirmed in a valid manner on the basis of manufacturability analysis.

3. When making sample products for customer approval, all customer drawings must be converted into fully readable documents for instructing production and inspection, with the Chief Engineer as the key actor. It was expected that, with the recommended actions having been taken, all production and inspections could be clearly guided with documents in the local language from the sample making stage.

4. Immediately after the receipt of purchase orders for routine manufacture and before replying to the customer with confirmed purchase orders, needed fixtures must be classified and the condition of them must be assessed, with workshop managers as the key actors. It was expected that, with the recommended actions having been taken, productions for regular customer orders could be organised smoothly with enough valid fixtures in place.

5. Immediately after purchase orders have been confirmed and before routine manufacture starts, required operator training plans and notifications against potential issues in production must be made, with the Chief Engineer, inspectors and workshop managers working together as the key actors. It was expected that, with the recommended actions having been taken, routine manufacture could be organised with enough fully trained staff, no emergency inspections and no delayed deliveries to customers.

Finally, to ensure that all the key actors perform their roles effectively, as the preliminary work before all the recommended actions to be taken, it was planned that job allocation and empowerment should be officially made to all the key actors by revising each actor's job specification towards Objective 1.

In the SSM work, the process to transform customer requirements and expectations into products and services was regarded as a process of job allocation and empowerment of staff members. It was expected that, as long as the process of job allocation and empowerment of staff members could be kept effective, customer requirements and expectations could be effectively transformed into products and services in a repeatable manner. With job allocation and empowerment, key actors' jobs and functions would be definitely specified and allocated, and they would be empowered to perform their roles independently in the manufacturing system to routinely achieve customers' quality requirements.

5.1.3 Initial evaluation of actions taken

At the end of the SSM work, it was agreed to measure the performance of the conceptual model of the SSM project by assessing E1 (efficacy), E2 (efficiency) and E3 (effectiveness) after six months. The initial evaluation was undertaken by me, with the involvement of Managing Director, the Chief Engineer and the Sales Manager. As confirmed by all participants, changes and improvements towards satisfying customer quality requirements have been made as follows.

Before the changes, engineers were often misled by customer drawings incorrectly translated by Business Representatives at the very beginning due to the lack of expertise in mechanical engineering and machining. After the changes, rather than translating customer drawing themselves like before, Business Representatives changed to working closely with engineers and relying on engineers to correctly interpret customers' technical requirements in the first place, and then translating the drawings carefully into the local language. Business Representatives and engineers report that this change makes their jobs much easier than before, and they are no longer worried that there would be serious misunderstandings on customer technical requirements as they prepare for the confirmation of customer enquiries.

Before the changes, routine manufacture was difficult to be organised smoothly, especially for the initial purchase order placed by customers, due to lack of analysis of manufacturability before confirming customer enquiries. After the recommended actions had been taken, it has become a routine task that manufacturability analysis

is made on all customer enquiries with the involvement of all needed business units before customer enquiries are confirmed. According to the Chief Engineer, routine manufacture for regular purchase orders placed by customers can now be organised much more smoothly than before due to all potential issues being considered and cleared in advance. He is no longer worried that the delivery of the initial customer orders will be delayed.

Before the changes, incorrect sample products were often made and delivered to customers due to the lack of formal production documents in the local business language. After the recommended actions had been taken, it is now a requirement in the firm that all customer drawings must be converted into production documents in local business language that play the role as the formal instruction throughout the whole manufacture process. It is confirmed by the Chief Engineer that omissions, misunderstandings or serious mistakes are now rarely made, and in most cases sample products are made correctly and the incorrect ones are identified before delivered to customers.

Before the changes, routine production often had to be rescheduled again and again due to a shortage of valid fixtures. Since the recommended actions have been taken, it is now a requirement in the firm that the classification and condition assessment of existing fixtures must be made immediately after the receipt of customer order for routine manufacture and before customer orders are confirmed, so that required fixtures may be prepared in advance. As the result of this change, the manufacturing engineers report that in most cases all required fixtures are in place as expected, and production can be organised on time.

Before the changes, production often had to be interrupted, emergency inspections had to be organised and deliveries to customers had to be delayed due to a shortage of fully-trained operators and in-time notifications of possible issues. After the recommended actions had been taken, it is now a requirement in the firm that immediately before customer orders are confirmed, all necessary operator trainings must be planned and notifications of potential issues in productions must be made. As the result of this, the Quality Control Unit and Production Unit report many fewer complaints than before against emergency inspections and shortage of fully-trained

staff.

One significant achievement has been made in the firm following the contributions described above. Before the changes there used be at least 10 delivery batches rejected by customers per half year due to serious quality defects. In the past six months with the recommended actions having been taken, only 5 delivery batches have been rejected. Although it is still too soon to forecast what might happen in the next six months, this has been the best performance in the firm's business history.

The improvements made to date indicate that customer's quality requirements may be much better satisfied than before. However, with five delivery batches still rejected in the past six months, it is still far from ideal for becoming a top supplier and more time is needed to achieve improvements in measuring the performance of the conceptual model of the SSM project, but there will be no changes or adjustments to the recommended actions towards Objective 1.

5.1.4 Comparison with literature review

According to Lai-Kow, and Ming-Lu (2002), through encouraging teamwork and cooperation between different business units, issues related to timing, cost and others could be effectively addressed. Barad and Gien (2001) argue that that human activities such as autonomous control of work quality and quality improvement teams play the most important role in quality improvement for small manufacturing enterprises. In the firm, it used to be difficult to effectively approach to quality management, customer needs analysis, planning management and engineering management, with consideration of timing and cost at the very early stages of production that are important for business effectiveness. As proposed, it would be better to be addressed as early as possible through an integrated human-activity approach, with empowerment and job allocation to be formally specified and made to stakeholders from different business units that work together in teamwork and cooperation manner.

The recommended actions described above indicates that it has been expected that all improvements should be made through teamwork and cooperation in the firm among different business units, by means of cross-functional cooperation (Song et al.,

1997), information sharing and internal communications (Harding et al., 1999), management of just-in-time logistics (Natarajan and Weinrauch, 1990), problem prevention (Stauss, 1993) and resource allocation (Colton and Staples, 1997), with formal empowerment by the firm.

As argued by Ozgener (2003), with multidisciplinary team members from all functional departments that are immediately related to products and production, customer needs may be analysed thoroughly and correctly translated, with the involvement of customers when needed. He goes on that, with such a multidisciplinary team, all potential issues can be found and solved in the very early production stages to avoid unnecessary corrective activities and re-production later. In the firm, customer needs used to be interpreted by some individuals with many misunderstandings. It has been proposed that, to satisfy customer quality requirements, customer needs should be analysed, interpreted and implemented collectively by a group of people from different functional departments with different disciplinary backgrounds.

The improvements described above concur with the ideas of earlier studies and the recommended actions may lead to more horizontal and direct communication between team members, that effectively coordinates the multidisciplinary resources needed for translating customer needs into products (Griffin and Hauser, 1992) and avoiding problems at the very early production stage in the firm.

However, after the recommended actions had been in place for six months, the firm still had five delivery batches rejected by customers. Although a significant improvement, such a quality status makes the firm still far from becoming a top supplier as expected. This indicates that we may need more time to see the entire effect of the implementation of the proposed changes, and when necessary customers should be used as a source of answers. The situation may improve in the future with key actors having more time to practise their roles and more customer involvement when needed.

5.2 Objective 2 – Becoming a more competitive supplier for target customers

Becoming a more competitive supplier was Objective 2 for the SSM process. It was

expected that, after the organisational and operational situation of the problem had been understood through my research, changes could be proposed, and actions may be recommended for implementing change and improving the firm's capability in this area, leading to finally solving the problem.

In this section, it reports in the following sub-sections the statements of the actionable knowledge towards Objective 2, and the the progress against Objective 2 after recommended actions have been taken for the first 6 months, and has the actual effect compared with ideas from reviewed literature.

5.2.1 The actionable knowledge

In the SSM work, as the understanding of the organisational and operational situation of the problem, it was found that:

1. Immediately after the receipt of customer enquiries, there was usually no immediate confirmation of receipt to customers. Consequently, customers might be worried. Competitors' immediate response to customers regarding the receipt of the same enquiries might make customers place purchase orders to someone else, so changes should be made to ensure that confirmation of the receipt of customer enquiries may always be made quickly to customers.

2. After deliveries were made to customers, usually nobody was sure about the actual quality status of the delivered products until quality issues were officially notified by customers. Consequently, quite often it was very difficult to take immediate and low-cost corrective measures in time in the firm to satisfy urgent requirements from customers; instead, only high-cost corrective measures had to be taken to satisfy customer's urgent requirements. Changes should be made to ensure that all quality issues found at customers factories after delivered could be known by the firm as soon as possible.

3. It was not set as the routine job in the firm that dedicated persons should keep in touch with customers in time when needed. In such a situation, questions or queries from customers would not be responded in time with a continuity by same persons, consequently it would be very difficult to maintain the customer service on a satisfactory level, and customers might have to offer their business to our responsive competitors. So, changes should be made to ensure that questions or queries from customers may always be responded in time with a continuity

5.2.2 Actions recommended for changes

Actions were recommended for desired changes as shown below.

1. In working hours, immediately after the receipt of customer enquiries, dedicated individuals must respond and confirm the receipt to customers within 2 hours, with Business Representatives being the key actors. It was expected that this could enable the firm to become more responsive and reliable for customers to make important enquires without worry.

2. After deliveries have been made to customers, dedicated individuals must keep in touch with customers, collecting their comments as soon as possible on the quality status of each delivery, with Business Representatives being the key actors, against the possibility that before receiving formal quality issue notices from customers they might have to go through a long bureaucratic procedure in customer management systems. It was expected that quick but low-cost corrective measures could be taken against possible urgent requirements from customers.

3. As a matter of routine, dedicated individuals must proactively keep in touch with customers who might only have individual questions or requests, with Business Representatives being the key actors. It was expected that this could enable the firm to develop a high level of both business and individual relationships with customers, who would then depend on as the first-considered supplier for developing their critical projects.

As part of the preliminary work described above, it was planned that job allocation and empowerment should also be made to staff members through revising each person's job specification towards Objective 2, to ensure that all personnel perform their roles effectively. Following this, nominated individuals will be able to keep communicating with customers independently so that a more competitive status would be developed through continuously improving both personal and business relationships with customers.

5.2.3 Initial evaluation of actions

Following the six-month trial period, it was confirmed that changes and improvements towards becoming a more competitive supplier have been made, as detailed.

1. A survey of customers showed that the quicker response time to initial enquiries had been noted, and perceived as an improvement in the firm's service level, which reduced their worries and helped improve their lead time for developing new projects.

2. Before the changes, when quality issues fed back from customers, it would be too late for the firm to take any low-cost corrective measures and the firm had to re-organise production urgently and airfreight replacement products at high cost to customers to satisfy their urgent

needs. Even so, customer production might still be delayed after the firm had tried its best. The improved communication with customers by Business Representatives now gleans detailed information about quality issues before customers issue a formal quality issue notice. As confirmed by the Chief Engineer, this has helped the firm to take quick corrective measures at low cost in advance, and replacement products urgently needed by customers may be made and shipped to customers in time.

3. The lack of dedicated individuals keeping in touch with customers as a routine part of the job to deal with customers' random individual questions or requests, meant that the firm did not maintain a high level individual relationships with customers. Since the new system was introduced, many customer difficulties have been resolved quickly by the firm, and customers have become much friendlier than before, indicating that both the business and individual relationships between the firm and customers have started to improve.

One particular achievement has come from these changes and improvements. The firm had never previously been the key supplier of any overseas customers, and no overseas customers had transferred any critical projects to the firm. Four months after the recommended actions have been implemented, one of the firm's important European customers intended to transfer a critical project to Asia for total cost saving purposes. After having visited and compared all their Asian suppliers, they have finally selected this firm as the best candidate, not only due to the reliable quality control system but also the impressive level of response the firm may maintain. This customer's critical project has been successfully transferred to the firm and the firm has become this customer's strategic partner.

With all the improvements achieved, the recommended actions may help the firm towards achieving Objective 2. Although it is still too early to effectively measure the performance of the conceptual model of the SSM work, all recommended actions may remain with no adjustments towards becoming a more competitive supplier.

5.2.4   Comparison with the literature review

According to Slater (1997) and to Woodruff (1997), creating superior customer value is key for a firm achieving survival and success for the long term in business environment, and a firm that develops customers in business market should regard customer value as the cornerstone of marketing management. Payne and Holt (2001)

argue that customer value relies on the idea of costs versus benefits, so managing relationship value helps firms to improve their supplier status. In my study, the firm is keen to build up a long-term supper-buyer relationship with customers and become a competitive supplier. According to these earlier studies, we should be able to show future customers clearly what distinct and perceived relationship value they could expect from the firm, and how the firm would be able to manage the expected relationship value for them.

The recommended actions described above indicate that the firm intends to manage relationship value through understanding the customer benefits and to set customer benefits as goals (Holbrook, 2005), managing relational drivers with customers (Palmatier, 2008; Stahl et al., 2003), managing customer-perceived value and value that might be superior for customers (Ulaga and Chacour, 2001; Slater and Narver, 2000).

Ulaga and Eggert (2006) found that to gain the key supplier status, firms must try to differentiate themselves from their competitors in the buyer-supplier relationship. Although product quality, delivery performance, direct costs, service support, interpersonal interaction, customer acquisition costs, supplier know-how, customers' time to market and customer operations costs are all the drivers perceived by customers to create customer value, it is the service support and personal interaction that are the core differentiator for suppliers to develop competitive advantage. In my study, it has been expected that we could become a competitive supplier with actions for changes in terms of not only improving customers' time to market with the firm's know-how and expertise, but also providing better services and personal for customers.

The improvements described above concur with the earlier studies, and indicate that customers support and active individual interaction with individuals from customers create values for the relationship between the firm and customers, and may help the firm differentiate themselves from competitors.

However, although all the improvements, especially the strategic partnership developed with one customer, may indicates a much better business performance

than before, we are still not sure how majority of customers would compare the firm with our competitors, thus it is still difficult to measure what the gap would be before the firm becomes the key supplier for majority of customers. In future, it may be necessary to have a market research with customers concerning how customers compare the firm with our competitors and how they would like the firm to improve further.

5.3 Objective 3 – Improving the relationship with our suppliers

Improving the relationship with our suppliers was set as Objective 3 for the SSM process. It was expected that after the organisational and operational situation of the problem had been understood through this research, desired changes could be proposed, and actions could be recommended for implementing the desired changes and delivering the desired effect.

In this section, it reports in the following sub-sections the statements of the actionable knowledge towards Objective 3, and the the progress against Objective 3 after recommended actions have been taken for the first 6 months, and has the actual effect compared with ideas from reviewed literature.

5.3.1 The actionable knowledge

It was found that suppliers were usually not involved in analysing manufacturability for routine manufacture when developing new products a the firm. When either sample products or routine products were made, it was often found that required materials could not be obtained in time if at all. Consequently, either the delivery of products to customer had to be delayed, or the manufacturing proposal made to customers had to be reviewed, leading to either the loss of profits or loss of business. It was proposed that changes should be made to ensure that suppliers could be involved in the analysis of the manufacturability of new products.

5.3.2 Actions recommended for changes

Based on the finding on improving relationships with the firm's suppliers, it was recommended that suppliers should be involved as stakeholders for analysing the manufacturability for routine manufacture. Purchasing Manager should be the key actor. It was expected that, with the involvement of suppliers, the availability of

materials could be confirmed, and correct decisions made concerning either continuing with the materials specified by customers or recommending alternatives for customers to approve. It was also expected that, after the recommended actions having been taken, manufacture for both sample products and routine productions could be organised with no difficulties over obtaining required materials. Finally, the supplier relationship could be massively improved due to the important status offered to suppliers in the firm's operating system.

Job allocation and empowerment was officially made to Purchasing Manager by revising his job specifications towards Objective 3, to ensure that the Purchasing Manager would be able to independently improve the relationship with suppliers on behalf of the firm, and all required materials or subcontracted services could be obtained in time in a sustainable manner over the long term.

5.3.3 Initial evaluation of actions

The initial evaluation of the actions after six months showed that both the Purchasing Manager and suppliers are now involved in the early stages of development of new products. According to the Purchasing Manager, the availability of required materials is now analysed at the very beginning, so all potential disagreements or difficulties may be considered and cleared in advance.

Another improvement has also been made in the relationship between the firm and its suppliers. We used to have at least 10 suppliers for required materials, but no suppliers wanted to sign a long-term contract. To ensure that all required materials could always be obtained in time, the firm had to change suppliers again and again. Consequently, a lot of scheduled production was delayed. Following the early involvement of suppliers as key stakeholders for all new projects, many have expressed their appreciation regarding their importance being recognised and respected in the firm's operating system and three have signed long-term contracts with the firm. According to the Chief Engineer and purchasing engineers, it has already helped a lot in obtaining the majority of required materials from those three suppliers.

It can be concluded that the recommended action may help the firm improve its relationship with suppliers, and so it was agreed at the initial evaluation meeting that

no adjustments should be made before measuring the performance of the conceptual model of the SSM process.

5.3.4   Comparison with the literature review

According to Mudambi et al. (2004), large organisations tend to develop a power-based relationship with their suppliers due to their large business size with high-volume purchase orders which puts them in a powerful and dominant position when dealing with their suppliers. In contrast, due to the disadvantage of small business size and low-volume purchase orders, SMEs are not able to dominate the purchasing relationship when dealing with their suppliers, so traditional techniques for supplier management sometimes do not work for SMEs. Instead of power-based relationships, Hald (2010) argues that the effective business relationship between SMEs and suppliers may be achieved through developing SMEs' attractiveness. For the firm, in the purchasing relationship with much larger suppliers, it does not have the power to dominate the business relationship but needed a high level of support from suppliers so that required materials can be obtained in time. According to the ideas from these previous studies, the firm should try to develop attractiveness that may be of interest and perceived by suppliers.

The action described above shows that the firm has the intention to attract suppliers by showing them that we regard them as critically important stakeholders in our supply chain system. It has expected that after the recommended action has had time to generate effect, the supplier relationship could be effectively improved.

According to Zheng et al. (2003), when there is the lack of power, trust takes the critical role for SMEs to attract suppliers, and Morrissey and Pittaway (2006) found that social factors – for example, openness, honesty and being kept informed – should be key constructs of a trust-based relationship. In my study, it has been proposed that the firm should try to develop a trust-based relationship that may create and enhance the firm's attractiveness to all suppliers.

The improvements described above indicate that the firm's open and honest attitude that keeps suppliers informed has been perceived and appreciated by some suppliers for building a solid trust-based relationship with the firm, and such a trustful

relationship may make the firm more and more attractive in future, leading to the relationship with suppliers effectively improved as expected.

However, although we have had three suppliers that have been signed off the long-term supply contract, we are not sure how important we are as the customer in their business operations, or how far we should go with other suppliers who have not yet signed off a long-term contract with the firm. In the near future, a study needs to be conducted with all suppliers concerning how they would expect the firm to make further improvements.

5.4 Objective 4 – Motivating employees for better performance

Motivating employees was set as Objective 4. It was expected that after the organisational and operational situation of the problem had been understood, changes could be proposed and actions may recommended for implementing the changes, leading to finally solving the problem.

In this section, it reports in the following sub-sections the statements of the actionable knowledge towards Objective 4, and the the progress against Objective 4 after recommended actions have been taken for the first 6 months, and has the actual effect compared with ideas from reviewed literature.

5.4.1 The actionable knowledge

In the SSM work towards motivating employees for better performance as Objective 4, it was found that:

1. Before confirming customer enquiries, there was no analysis of training of qualified staff members, and contributions to be made by important employees for developing new products were not be measured. As result, important employees used to manufacture existing products would be reluctant to be involved in making new products. It was proposed that changes should be made to ensure that important employees' importance and extra contribution to the development of new products for future routine manufacture should be analysed from the very beginning of each new product project.

2. When making sample products for customer approval, the training of important staff members and formal recognition of contributions were not carried out. Consequently, staff members might not be able to make extra contributions, and the expected progress of developing new products would be affected. It was proposed that changes should

be made to ensure that important staff members' value should be formally recognised from the sample-making stage.

5.4.2 Actions recommended for changes

Actions were recommended as follows:

1. When analysing the manufacturability of new products before confirming customer enquiries, who will be trained and how staff members' extra contribution would be rewarded must be analysed, and the sense making should be made to those who would be involved in future. The Chief Engineer is the key actor. It was expected that important staff members, including production engineers, technicians and inspectors, would be happy to be involved and take extra training and make extra contributions for the development of new products, monitoring the whole manufacturing system of both sample making and routine productions, and leading to the smooth and successful delivery of any new projects.

2. When making sample products for customer approval, training of important staff members must be made immediately before production. Their contributions must be measured in the production of sample products, and how their extra contributions would be rewarded must be finalised immediately after the production of sample products. The Chief Engineer is the key actor. It was expected that important staff members would keep active in monitoring the whole manufacturing system of the firm, finally leading to the reliable manufacture of all products for all customers.

It was also planned that, before all the recommended actions were taken, job allocation and empowerment should be officially made to the Chief Engineer by revising his job specification in pursuit of Objective 4, as part of the preliminary work discussed in Section 5.1.1. With job allocation and empowerment made to the Chief Engineer, it was expected that he would be able to independently plan how to motivate employees for better performance in the process of realising customer products.

5.4.3 Initial evaluation of actions taken

An initial evaluation of actions taken for changes in motivating employees for better performance was also made. As confirmed by the Chief Engineer:

1. before the changes, it was often very difficult for him to persuade important staff members to organise the manufacture of sample products, due to the absence of analysis of both manufacturability and needed staff at the very beginning of each new project. Consequently,

nobody wanted to pause from the routine jobs they were used to for any new product projects they were not familiar with. After the changes, it is a requirement now in the firm that at the very beginning of each new product project , the analysis of both manufacturability and needed staff must be made. When necessary, the sense-making of those that would be involved in future must also be made. According to the Chief Engineer, the firm is now quite different from before and usually there is agreement in advance between the Chief Engineer and relevant staff members for each new project, and in most cases relevant staff members are quite happy to pause from their routine jobs and be involved in the manufacture of sample when needed.

2. It was previously often very difficult to assign tasks to the required staff members for organising the first routine manufacture of new products, due to the lack of official commitment on how they should be rewarded for the extra contribution made. The recommended actions have made a change to a default state in the firm that the official commitment must be made on how relevant staff members would be rewarded for extra contributions made to each new project. As confirmed by the Chief Engineer, in most cases tasks for the first routine manufacture of new projects now may be assigned smoothly to staff.

As also confirmed at the meeting, an unexpected achievement has been made. Before the recommended actions were taken, we used to have at least three important employees quitting their jobs immediately after the Chinese New Year holidays. As a result, the firm had to recruit new employees to fill important positions. Since the changes, for the first time ever, all employees came back after Chinese New Year 2017 and have stayed with the firm to date. It may indicate that the changes and improvements described above have started to increase employee satisfaction with the firm.

With all the improvements described above, it was agreed at the meeting that important employees may be much more effectively motivated than before. However, it is still too early to conclude that they are sufficient for solving the problem. As also agreed at the meeting, all the recommended actions should continue without any adjustments for at least six more months.

5.4.4 Comparison with the literature review

In their studies, Moran et al. (2012) argued that highly motivated employees could contribute high employee performance with their responsive attitude towards the definite goals and objectives being pursued. Kalimullah et al. (2010) found that it

should be essential to increase employee motivation because highly motivated employees would be more likely to constantly look for improved practices at work. In this study, it has been proposed that employee performance should be improved through management of employee motivation.

The actions taken indicate that the firm has expected to have employee performance improved through employee motivation management, with the consideration of reasonable rewards (Ali and Ahmad, 2009; Khan, 2010), a strong sense of belonging, pride and responsibility (Yazdani et al., 2011), trust (Annamalai, 2010) and staff training (Abadi et al., 2011), that are regarded as important by employees.

The improvements made indicate that the recommended actions for changes have started to effectively motivate employees, and employee motivation has directly increased employee performance and business effectiveness (Manzoor, 2012) in the firm. However, with the recommended actions having in place for only six months, it remains difficult to confirm whether the actions are sufficient or additional actions are required.

Chapter 6. Conclusions

6.1 Introduction

This Chapter has a number of aims. Firstly I summarise the contribution made by this study towards achieving my firm's strategic goal of being a high-end supplier. Secondly, I argue for the implications of the study for wider professional practice in contexts where operational improvements are constrained by limited resources. Finally, I suggest some possible limitations of the study.

In Section 6.2 I will summarise the contribution of the research in terms of the progress made in the improvement of the organisational issues in the firm, including progress towards realising the research objectives and answering the research questions.

Although this study is focussed on the specifics of the firm, in Section 6.3 section I will discuss the implications of the study for wider professional practice, and in Section 6.4 I will explain the limitations of the research.

6.2 Summary of the contribution of the research to the Firm

In this section, it reports in the following sub-sections the statements of the summary of the contribution of the research to the firm through revisiting the research organization issue, the research objectives, the research questions, the progress made with the SSM work, and progress made after six months of implementing changes.

6.2.1 The organisational issue in the firm

The motivation for my research project was the need to improve the existing firm's capability from a low-end supplier to that of an effective supplier that could help the firm to develop a productive and sustainable relationship with key customers sourcing high quality products internationally. The overall research question for my thesis research project was identified as: as a small low-end manufacturing enterprise in international business environment, how to achieve a competitive supplier status that can sustain for long term?

In the following sections, as the contribution, the implications of the study in the context of my organization will be discussed through firstly revisiting the research

objectives in Section 6.2.2 and research questions in Section 6.2.3, and then summarising the progress made in SSM work in Section 6.2.4 and the progress made after six months in Section 6.2.5.

6.2.2   The research objectives

To solve the identified problem in the firm, in Chapter 1 the overall objectives of my thesis research project were set as: (a) to determine what and how management activities should be re-organised for the organisation in future, and (b) to determine what actions should be taken immediately for the organisation.

In Chapter 4, in empirical work of the research (i.e. SSM), four streams of improvements were finalised to make progress towards four sub-objectives: Objective 1, exactly achieving customers' quality requirements; Objective 2, becoming a more competitive supplier for target customers; Objective 3, improving the relationship with suppliers; and Objective 4, motivating employees for better performance.

6.2.3   The research questions

To help conduct my Literature Review, at the end of Chapter 1, four sub-questions were posed: (a) how might target customers' quality requirements be exactly satisfied; (b) how can we achieve competitive supplier status with target customers; (c) how can we construct an effective relationship with the organisation's suppliers; and (d) how can employees be motivated for better performance?

As the outcome of Chapter 2, it was noted that the problem should be addressed through adopting four streams of improvements: (a) forming a QFD team to satisfy customers' quality requirements; (b) establishing a customer support team to improve competitive advantage; (c) constructing a supplier trust development team to improve supplier relationship; and (d) building an employee motivation management team to specifically enhance empowerment and recognition on employees' fulfilment of contracted tasks and extra contributions, which should be merged together for the firm. However, it was argued that our limited resources meant that to solve the problem, these four streams should be merged. This was identified as the main methodological challenge for my action research, through which I expected that, together with a convened team of "co-researchers", I could work out an integrated

system of purposeful management activities and then figure out what actions should be taken in the organisation.

6.2.4 The progress made with the SSM work

As the outcome of the SSM work, through data collection from four streams of improvements, it was found (Section 4.2) that ten key challenges existed in the firm: (a) quality control on subcontracted processes; (b) qualified staff training; (c) planning of standard spare parts and devices for production; (d) classification and condition assessment of fixtures; (e) in-time notification of issues emerging in production; (f) emergency inspections; (g) localisation of customers' technical requirements; (h) in-time responses to customer queries and questions; (i) company-level personal relationship with suppliers; and (j) review on staff benefits and official recognition on staff contributions.

Based on these key challenges, in Section 4.2 job allocation and empowerment of staff members to transform customer requirements into products and services was identified as the major area for improvement through the SSM process. Finally, in Section 4.3 it was concluded that to solve the problem all the four streams of improvements should be made in a holistic manner through the construction of a system owned by the senior management of the firm to ensure that the transition flow from manufacture of sample products to routine manufacture is repeatable, by job allocation and empowerment of staff members against the 10 key challenges faced by the firm in routine business operations.

Based on the conceptual model of the system constructed in Section 4.4, it was concluded that purposeful activities of this system should be organised in future in seven stages along the manufacture flow in the firm:

1. Stage A. immediately after customer enquiries have been received, customers should be contacted by dedicated staff members about the receipt of enquiries and timescale of quotes.

2. Stage B. immediately after customers have been contacted, customer drawings and other technical documents should be interpreted and translated into the local business language officially and collectively.

3. Stage C. before confirming customer enquiries with quotes, manufacturability should be analysed collectively for routine

manufacture in future.

4. Stage D. when making sample products for customer approval, customer drawings should be converted and translated collectively into fully readable documented production and inspection instructions.

5. Stage E. immediately after purchase orders from customers have been received and before confirming customers for routine manufacture, deliverability of the orders should by analysed collectively.

6. Stage F. immediately after purchase orders have been confirmed and before routine manufacture starts, preparation plan should be made collectively for smooth productions.

7. Stage G. after deliveries have been made to customers, customers should be kept closely in touch concerning the quality state of the delivered products by dedicated staff members.

After the comparison between the real world in the firm and the system of purposeful activities for future, it was decided (Section 4.7) to have every staff member's responsibilities formalised, and that job allocation and empowerment must be officially made to all relevant key actors for performing the proposed changes through revising each key actor's job specification. Afterwards, actions for change should be taken in seven parts:

1. Part A: The receipt of each customer enquiry must be confirmed back to relevant customer within 2 hours of receipt, with Business Representatives as the actors.

2. Part B: Before any customer drawings are translated into local business language, Business Representatives must involve relevant manufacturing engineers and read and interpret drawings with them. The interpretation of customer technical requirements must be agreed by relevant manufacturing engineers before translated into local business language.

3. Part C: For each enquired product, manufacturability for routine manufacture in future must be analysed against potential issues related to localisation of customer technical requirements, quality control on subcontracted processes, qualified staff training, obtaining materials from suppliers, planning of standard spare parts and devices for routine production, and deployment of needed labour resources, with manufacturing engineers, quality engineers, the Chief Engineer, Purchasing Manager and Business Representatives as the key actors.

4. Part D: All customer drawings must be converted into fully readable documents for instructing production and inspection as sample products are made to prevent potential issues related with localisation

of customers' technical requirements and recognition of staff members' actual contributions for benefits, with the Chief Engineer and Business Representatives as the key actors.

5. Part E: In addition to the factors considered for analysing the deliverability of purchase orders placed by customers for routine manufacture, needed fixtures must be classified and the condition must be assessed, with workshop managers and Business Representatives as the key actors.

6. Part F: In addition to the factors considered for preparing smooth production, a staff training plan and notification measures against potential issues to be emerging in productions must also be considered and under the control of the Chief Engineer, inspectors, workshop managers and Business Representatives as the key actors.

7. Part G: Business Representatives must keep in touch with customers and ask about the quality status of each delivery batch.

6.2.5   The progress made after six months

After all the recommended actions had been taken for six months in the firm, it was found that:

1. Towards Objective 1, rejected deliveries batches have been reduced from 10 delivery batches in six months in the past to 5 delivery batches now. This is consistent with customer's quality requirements being better satisfied than before, with the recommended actions taken to implement desired changes.

2. Towards Objective 2, as one of the typical achievements, one European customer's critical project has been successfully transferred to the firm and the firm has become this customer's strategic partner. This achievement suggests that the recommended actions for desired changes may help the firm towards achieving Objective 2.

3. Towards Objective 3, three important suppliers have signed long term contracts with the firm. This helps a lot in obtaining the majority of required materials from these suppliers. A tentative conclusion is that the recommended action has helped the firm improve the relationship with suppliers.

4. Towards Objective 4, for the first time ever, all employees have returned after Chinese New Year 2017 without the loss of any key staff. This may indicate that employee satisfaction has been improved.

With all the achievements made after all the recommended actions have been taken in the firm, it may be concluded that: (a) the answers for the research questions are valid; and (b) the recommended purposeful activities and actions may effectively lead

to the realisation of the research objectives.

6.3 Implications of the study for wider professional practice

The performance improvements noted in Section 6.2 suggest that in a small business like my firm, with limited resources for solving problems with different key stakeholders, it is not necessary to form many separate teams pursuing different objectives in a bureaucratic manner like in large firms. Instead, an alternative approach such as SSM that helps to solve problems in a holistic manner may work more effectively. In the SSM work, to seek solutions for solving the problem, three relationships were considered key: customer relationship, supplier relationship and employee relationship. It was thought that all key issues related to the problem were actually from these three key relationships. Four stream of improvement objectives were collectively agreed to collect data for the initial actions to be taken and changes to be implemented in an integrated manner, through the construction of the conceptual model of key human activities for the future, with the below advantages:

1. Customer quality requirements may be satisfied through early analysis of manufacturability with the early involvement of all key stakeholders.

2. Competitive supplier status may be achieved through improving and enhancing customer support and personal communication with individuals from customers.

3. Solid support from suppliers may be achieved through building trustful relationship with suppliers.

4. Employee performance may be improved through management of employee motivation.

However, I have only focused on achieving customers' quality requirements, becoming a more competitive supplier, improving relationship with suppliers and motivating employees for better performance as the main work streams for making improvements and changes. Consequently, effects from other stakeholders have been ignored and no proposals for changes and actions against effects from other stakeholders have been made. As a result, the actual effectiveness of solving the problem might be affected. To ensure that more data could be collected for constructing a more complete Rich Picture that represents more accurate structured situation of the problem, then other stakeholders could be involved in future research.

For other firms, different relationships and effects from other key stakeholders may need to be analysed in accordance with the specific situation in their specific business context to identify additional work streams that could help to develop additional actions.

6.4 Limitations of the study

With the SSM process of this study, an action plan has been worked out to implement a set of desired changes in a systemic manner and achieve the four objectives. With the achievement of these objectives, the problem is expected to be finally solved.

However, the feature of the SSM process may limit the realisation of my objectives. In this study, the SSM process was organised towards the four work streams. So when data was collected, possible effects from other stakeholders, such as local authorities, were not considered at all. Unlike many other countries, in China each firm is licensed to trade within a limited scope of business as approved and presented on the company licence. For any additional scope of business, a firm is required to get approval first from local authorities, and the company licence updated. Otherwise, the additional business may become illegal. So, it is important to maintain a proper relationship with local authorities so that advice concerning any additional business may be obtained in advance at the beginning of each new project. However, in this SSM work, the effect of local authorities was not considered. As a result, data from that dimension was not collected. This might slightly affect the effectiveness of solving the problem. In future SSM work, the effect from local authorities should also be considered.

Chapter 7. Reflections of a scholar-practitioner

7.1 Introduction

I have experienced and learned a lot of things in the research journey I have undertaken for my DBA thesis project, which has developed me as both an inside researcher and scholarly practitioner.

In this chapter I will discuss how I have grown as an action researcher through reflecting on my role in the research process in Section 7.2; reflecting on what went well or badly within the research in Section 7.3; critically evaluating my reflections in my research process in Secton 7.4; arguing for the implications of the study for my professional practice in Section 7.5.

7.2 Reflections on my role in the research process

As the inside researcher and the senior manager of the firm, I played a dynamic role in the research process. On one hand, the role helped me to guide the participants through the whole research process; but it also made it convenient for me to access all the resources when data was needed at any time. Although sometimes it was challenging for me to play my role due to the impact from relationships between different functions in the firm, it was beneficial for the completion of the whole research process through developing me the insights that were gained by interacting with the literature and being an insider action researcher, with SSM as the methodology for my action research (see Chapter 3).

First of all, I guided the establishment of the project team in the firm to conduct the research. In the research process, the project team were not simple participants, but rather co-researchers with whom I refined the research problem, the research objectives and the relationships between key stakeholders. As the result, the whole research process was gone through with the assumption on the identified relations between stakeholders, and all empirical data was collected and analysed through closely working with the identified participants.

Secondly, I conducted the literature review, drawing on existing knowledge that could show me what was already known for solving the problem, and refining the

overarching question for my empirical work. I also implemented as a co-inquiry process Checkland's (1999) seven-step Soft System Methodology (SSM) as the action research methodology for my empirical work. The recommendation of actions and the evaluation of the resulting improvements were the outcomes of the whole research process.

Thirdly, along with research process, I made critical reflections on each phase of the research process, not only to analyse progress, but to clarify my learning and what attention should be paid in the next phase. As I worked with the participants to go through the seven steps of the SSM work, the critical reflection I applied to each step ensured all the required data was effectively collected and processed as the basis of the next step. As I progressed throughout the whole research process, I also continually reflected on the statement of the problem, research objectives and research questions to ensure of its continued relevance in light of research findings.

Finally, as I collected data in the SSM work in the role of both researcher and one of the participants, I sometimes found that some participants were unwilling to express themselves in a straightforward manner due to the power relations between them and me or others, especially those who did not share the same interests as them. In such cases, I played the role as the coordinator to either explain to relevant participants or re-group them.

7.3   Reflections on what went well or badly in the research process

My research was rewarding to me, and I gained and learned a lot throughout the whole process. It was an important experience as I practiced a methodology for solving management problems that was new to me. Specifically, I think the research process mainly rewarded the research project in four aspects.

First, the creation of a deep understandings of inter-relations between stakeholders. The complexity of three key relations between the firm and customers, suppliers and employees identified in Chapter 1 effectively helped me approach the conduct of my literature review. In addition to these relations between key stakeholders, in the SSM work the importance of inter-relations between participants was also clearly evident as I collected qualitative data in the SSM work. On the basis of these relations between

stakeholders, data was effectively collected and analysed for structuring the situation of the research problem, developing the root definition of relevant system, constructing the conceptual model of relevant system, comparing the conceptual model of relevant system with the reality in the firm, and finally having the plan of recommended actions approved.

Secondly, the effective review and application of the literature to the firm's context. The review and application of the literature played a critical role in the research process. With the knowledge drawn from the literature review, not only were potential solutions informed in different dimensions, but also the overarching need was identified to integrate the four dimension during the research process. Based on the outcome of my literature review, the application of other literature effectively helped me to identify SSM as the systemic methodology for me and other participants to collectively collect, analyse and present qualitative data, with final recommendations for actions to realise the objectives of the research.

Third, the deployment of the new research methodology for making collection and analysis of qualitative data, and recommendations of actions. It was the first time that I had employed SSM as the methodology in the research process. Immediately after SSM was identified as the methodology for my empirical work, I was not confident what might happen as I worked with the project team. As I collected data in the first two steps of the SSM work, I still struggled in designing questions for interviewing participants, using the collected qualitative data to structure the situation of the problem, and identifying key issues as the routine challenges from the structured situation. However, as I progressed to Step 3 of the SSM work, my understanding of the problem continuously improved. I gradually developed enough experiences with my participants to smoothly go through the following steps of the SSM work. With the appreciation of the Managing Director for both the recommended actions and the achievements made after six months, it indicates that the deployment of the new methodology in the research process was satisfactory.

Finally, the continuous reflections on the progress of each research stage for improving my understanding of the problem. In each stage of the research process, and particularly in the SSM work, I continuously applied reflections on where I was,

what I had learnt and what I should do in the next stage. With these reflections, my understating of the research problem, the research objectives and the progress of the research process were continuously improved.

However, in the earliy stage of my research process, there were issues of concern to all participants that impacted slightly the progress of my research. In the research, I was not only participants' colleague but playing the role as the insider researcher, so they were worried that I might ask them questions they would never want to answer and I might request information that they would never want to disclose to me and others. Also, I sometimes found that some participants were unwilling to express themselves in a straightforward manner due to the power relations between them and me or others; especially those who did not share the same interests with them. Although I finally found solutions for these issues, in future if offered the opportunity, I would spend extra time to engage in sensemaking with all participants as early as possible about what the roles as co-researchers might mean in practice. In this way we would explore together what might happen to them; what questions they might be asked with in the empirical work and so on. so that both questions for interviewing participants and participants themselves may be better prepared before initial data collection. I would think it may help to collect data more effectively.

7.4 Evaluation of my reflections in research process

In the early stage of the research process, it was thought that customers, suppliers and employees were key stakeholders that were critically interrelated with the firm, with a potential that the firm's business could be directly ended by them. So, I thought I should approach solving the problem through considering how to construct proper relations with customers, suppliers and employees. I therefore assumed that, as long as I could get these three relations smoothly coordinated together through the research, the research objectives would be realised, and the problem solved. In the later stages of the research process, the conduct of my literature review, the choice of methodology for my empirical work, the recommendations of actions to take for desired changes were all made on the basis of this assumption.

With all that I have reflected on in the research process, it may now appear that the

research process has been progressed very smoothly with an approved action plan as the outcome of the SSM work. With all the achievements in the six months since implementation of the actions, the recommendations have shown their value. Whilst it is been agreed in the firm that more time should be spent on taking all the recommended actions, all the current outcomes of the research may indicate that the assumption I have made for the research is valid.

With all the achievements that have been made so far in the firm, I am aware now that to be competitive in the market, the firm does not have to dominate the relationships with customers, suppliers and employees like big firms. Instead, as long as the firm could position itself correctly in these relations, big customers may still offer us key supplier status, dominant suppliers may still like to solidly supports us, and employees may not only be willing to make more contributions but play their roles as agents of change. As long as the senior management have empowerment and job allocation of employees sustainably maintained, the firm may continuously make improvements and achievements as desired.

However, we have recently lost two important employees due to personal issues. Although we recruited their replacements in time and job specifications have been clarified to allow empowerment and job allocation, it seems to me that it is challenging for new employees to get used to taking the actions recommended in the research. I have already considered in the research that we might lose employees in future, but obviously I have under-estimated the challenge we may encounter with new employees. I am also aware now that the research process was actually the process for both myself and other participants to improve the understanding of the research problem as co-owners. Those who have never been involved in the research process would be struggling for some time before they have become an additional owner of the problem. I think an additional training course may thus be needed, tailored to forming a bridge the new employees and the outcome of this research project, as a routine arrangement for future in the firm.

7.5 The implications of the study for my professional practice

7.5.1 How this research project has influenced my management thinking

After I have gone through the whole research process, I have found that my professional practice has been influenced significantly with a lot of changes, in both my own management thinking and my own management practice. From all I have experienced, learned and gained from this research project, I think the application of SSM for collecting and processing qualitive data for action research has influenced my professional practice the most.

Before I conducted this research project, although I had encountered new knowledge and developed skills in my DBA journey concerning how to think in a critical way, I still felt that it was challenging to either find an approach to 'wicked' problems or make critical reflections on myself as I addressed problems. Since I completed the whole research process with SSM as the methodology of my action research, I have now found that I am sufficiently skilled in approaching to the complete situation of complex problems in my management practice, with all key stakeholders and relations between stakeholders considered holistically, and I may easily go back to the start point to reflect on myself with a clearly improved understanding of the problems

7.5.2 How this research project has influenced my management practice

What I have learnt from the research?: in the research process, SSM helped me to structure problem situations and collect and process qualitative data in a systemic way, thereby generating a complete package of actions recommended for organisational changes. I have already started to address other management problems in my practice in this holistic manner, even before I have completed the research process. Whilst I sometimes might still approach from an incorrect direction due to starting with invalid assumptions for solving problems, in most cases I can smoothly correct myself later, with finally a complete package of recommended actions.

How I will process in my managerial practice?: with these advantages, in future I will not only continue the use of SSM methodology in my own business unit, but promote its use throughout the firm. As approved by the board of directors, a periodic training course will be established by me as a mandatory arrangement for training both senior

managers and middle managers.

Appendices

Appendix 1: Data Collected in Step 1 of SSM

Work Stream	Business Units	Data Collected in Step 1 of The SSM		
		A, how do you summarise your role in one sentence?	B, how have you been playing your role to date?	C, Suggestions for improving your specific situation?
QFD management for exactly satisfying customers' quality requirements	Business Representatives from Sales Unit.	We are the interface for customers' technical/quality requirements to be clearly expressed and timely implemented to production.	When we receive enquiries with drawings and other technical documents from customers, we translate customers' technical requirements into Chinese language, request the Chief Engineer to organise meetings involving all needed staff members he thinks necessary for assessing our technical ability for satisfying customers' technical requirements, making quotations, making initial samples, organising regular productions, raising and providing inspection/test reports with deliveries, all according to customers' quality requirements.	We are not confident with the quality of subcontracted products, as most of the subcontractors either cannot provide quality conformity certificates or do not have the ability to conduct needed tests in house.
	Chief Engineer' unit.	As per customers' technical/quality requirements, I direct and instruct how to engineer manufacturing systems, supervise progress of work directed and instructed by me, ensure all needed resources for manufacturing are in place.	1, For new products development, I organise meetings on request by Business Representatives to study customers' technical/quality requirements and work out prices, engineer initial samples making, and engineering tooling/fixtures making for first-off production. 2, For old/regularly made products, I work closely with production engineers to ensure that all products are made properly to customer's technical/quality requirement. 3, After delivery, I organise meetings to study quality issues fed back from	We are short of qualified foremen for each workshop, I expect that we can develop enough qualified foremen through training existing staff members on workshop floors

			customers and work out solutions.	
	Production Engineers from Production Engineering Unit.	As per purchase orders from customers, we plan and programme productions, to ensure that all products are made properly and timely.	1, receive customer purchase orders from the Chief Engineer' unit, we plan and programme productions independently. 2, when materials are delivered at our factory, we check both dimensions and quantities, to ensure that we have not only correct but enough materials for productions. 3, supervise the provision and maintenance of needed tooling and fixtures. 4, keep communication with quality inspectors to ensure that all products are made correctly.	1, We expect that dedicated persons could be arranged to check all fixtures and inspection devices, and get them changed when necessary. 2, we expect that we have enough universe or similar fixtures, to make that all productions can be conducted timely.
	Purchasing Manager's unit	My role is to ensure that all purchased materials and subcontracted products are exactly correct as required and instructed by Chief Engineer's Unit.	1, for new products develop, we are involved by the Chief Engineer to ensure that required materials can be correctly obtained, and advise material costs. 2, in regular productions, when qualify issues on materials emerge, work closely with other business units, analyse existing stock, and then work out solutions. 3, ensure needed and correct spare parts are purchased timely for regular productions.	Requests of spare parts from workshops are not planned properly, which causes purchases repeated unreasonably.
	Quality Engineers/Inspectors from Quality Control unit.	We are the watch dog for checking finished products' quality.	We check each products' appearance and dimensions before release to warehouse or despatch to customers' drawings, which are usually not translated.	Sometimes we have too many products to check. We do not have enough inspection devices as actually needed.
Customer personal interaction	Business Representatives from the Sales unit.	We are the bridge to connect the communication	1, in regular productions, if issues emerge, then it is us to inform and negotiate with customers.	No expectation at the moment.

		between customers and our firm.	2, When customers need to make changes, find issues after delivery or have additional requirements, we take the responsibility to coordinate with both internal business units and external resources.	
	Chief Engineer's unit	I are an assistant of the Sales unit to work out solutions for issues that might be fed back by customer at any time.	Immediately after having been informed and requested by the Sales unit, with issues or additional requirements from customers, I organise the study of issues or additional requirements and work out solutions as soon as possible for the Sales unit to speak to customers.	No expectation at the moment.
	Managing Director' unit	When the Sales unit and the Chief Engineer's unit make customer supports, I make decisions for needed investments and expenses.	1, in new products development, I make decisions for new or additional facilities and equipment as suggested by Chief Engineer. 2, in handling issues after sales, I make decisions on investment and expense making if I am involved.	No expectation at the moment.
Build a trustful relationship with suppliers	Purchasing Manager' unit	I am in charge of building and maintaining supplier relationship with suppliers	1, I source suppliers and purchase materials from suppliers developed by myself. Negotiation is main manner I deal with suppliers. 2, payments are only made after deliveries of purchased materials are made to our firm. Payment of one delivery batch is usually held in case suppliers break their credit.	No expectation at the moment.
	Financial Manager' unit	We look after paying invoices from suppliers	1, all invoices from suppliers are directly sent to a dedicated person as assigned by the firm. After received invoices are checked and accepted by this person, invoices are forwarded to us and we check them again. If we are happy, then we make the	No expectation at the moment.

			payment as soon as we have enough money in our firm's bank account.	
	Managing Director' unit	I am not involved in making any decisions in purchasing management.	When suppliers visit our firm, I try to see them in courtesy	No expectation at the moment.
Employee motivation management	Human Resource Manager' unit	I look after staff welfare/benefits	1, I mainly look after staff's welfare/benefits, in terms of foods, drinks, health, accommodation arrangements. 2, help the Chief Engineer to keep staff members happy, negotiate with staff and decide labour rewards for temporarily additional work.	No expectation at the moment.
	Headmen of workshops	We bridge the communication between staff members on workshop floor and the management units of our firm.	1, when management units need to make changes or take actions on workshop floor, it is us to explain and show our fellow colleagues. 2, if our fellow colleagues have issues, we first of all need to find out if we could solve them ourselves; if not, we have to feed back to management units.	No expectation at the moment.
	Managing Director's unit	I am in charge of decision making on key staff members' salary, bonus and benefits, including Business Representatives, Production Engineers and the Chief Engineer.	By the end of every year, I organise person to person interviews with key staff members and negotiate with them how their salary, bonus and benefits might be added next year.	No expectation at the moments.

Appendix 2: Identification of Issues

Work Stream	Issues Identified in the Context of the Rich Picture
QFD management for exactly satisfying customers' quality requirements	Sales Units and the Chief Engineer identified that it was not sure how quality of subcontracted components should be monitored, for example, as experienced by them, it was often noted too late that test reports to be issued by subcontractors were actually ignored by subcontractors.
	Human Resource Manager and the Chief Engineer identified that it was not sure how needed qualified staff should be developed, for example, as experienced by them, usually they knew there was a short of foremen and who might have the potential, but they had no ideas what and how training should be taken to these candidates.
	Purchasing Manager, production engineers and the Chief Engineer identified that it was not sure how the need of standard spare parts or devices should be monitored, for example, in the practice, special and expensive CNC cutters were needed from time to time, but them were often notified too late to purchase in time.
	Quality Control Unit and production engineers identified that it was not sure how to ensure enough fixtures for productions, for example, it was quite often that immediately before they really needed fixtures for making components, they found they were short of fixtures, but it was too late to make enough in time.
	Sales Unit and Quality Control Unit it was not sure that how all relevant units should be notified about issues emerging in productions in time, for example, sometimes they found themselves that some machining stopping running due to certain issues, but nobody told them exactly what the issue as quick as they expected.
	Sales Unit, Quality Control Unit and the Chief identified that it was not sure how emergency inspections should be either avoided or effectively conducted, for example, prior to every Chinese New Year holidays, emergency inspections were requested conducted by the Quality Control Unit for almost each outbound shipment, without any improvement measures so far.
	Quality Control Unit and Purchasing Manager identified that it was not sure that how customer requirements on drawings should all be understood by all relevant business units, for example, it was often that certain customers' requirements in English version were provided to Quality Control Unit and Purchasing Unit as instructions, but they had never been exactly implemented due to the difficulty for Quality Control Unit and Purchasing Unit to read in English.
Customer personal interaction management for becoming a competitive supplier for multiple customers	Sales Unit and the Managing Director identified that it was not sure that how responses to customer queries and questions should be made in time, for example, existing customers were from different time zones and therefore customer emails were often sent through after work, as a result, they were not able to reply until the next working day although sometimes customers might expect an immediate reply in no time.
Build a trustful relationship with suppliers	Purchasing Manager's Unit and Financial Manager's Unit identified that it was not sure how the Managing Director should play his role in developing a trustful relationship with suppliers, for example, quite often they felt that with the presentation of the Managing Director suppliers would be happy to offer more supports, but obviously it was usually difficult to get the Managing Director involved frequently due the nature of his position.

Employee motivation management	Human Resource Manager's Unit identified that it was not sure how staff benefits should be reviewed and how recognition on staff contributions should be made, for example, they agreed that staff contributions should be recognised and rewarded, but in practice when and how such contributions could be measured?

Appendix 3: Draft form for comparison between conceptual model and real world

Target Stage of TransitionFlow	Purposeful Activities	Real World and Gap	Gap	Comments and Recommendation
Stage A, immediately after customer enquiries have been received:	involve dedicated persons to confirm customers the receipt of enquiries and timescale to make quotes, against potential issues related to in-time response to customer queries and questions. Keep interaction with customers in this stage.			
Stage B, immediately after customers have been confirmed with the receipt of enquiries:	involve and empower qualified persons to collectively interpret customer drawings exactly and translate into local business language officially and completely, against potential issues related to localisation of customer technical requirements. Keep interaction with customers in this stage.			
Stage C,before confirm customer enquiries:	involve and empower internal stakeholders to collectively analyse manufacturability for routine manufacture in future, against potential issues related to localisation of customer technical requirements, quality control on subcontracted processes, qualified staff training, obtaining materials from suppliers, planning of standard spare parts and devices for routine production, and deployment of needed labour resources. Keep interaction with customers and suppliers in this stage.			
Stage D,when making sample products for customer approval:	involve and empower internal stakeholders to collectively convert translated customer drawings into fully readable documented production and inspection instructions, against potential issues related to localisation of customer technical requirements and recognition on staff members' actual			

	contributions for benefits. Keep interaction with customers and an eye on competitors' activities in this stage.			
Stage E, immediately after purchase orders have been received and before confirming customers for routine manufacture:	involve and empower internal stakeholders to collectively analyse the deliverability, against potential issues related to classification and condition assessment of fixtures, emergency inspections, subcontracted processes, obtaining materials and deployment of labour resources. Keep interaction with customers and suppliers in this stage.			
Stage F, immediately after purchase orders have been confirmed and before routine manufacture starts:	involve and empower internal stakeholders to collectively make preparation plan for smooth production, against potential issues related to planning of standard spare parts/devices for production, classification and condition assessment of fixtures, in-time notification of issues emerging in production, quality control on subcontracted processes, qualified staff training, in-time delivery of raw materials and emergence inspections. Keep interaction with customers and suppliers in this stage.			
Stage G, after deliveries have been made to customers:	involve dedicated persons to keep in touch closely with customers over the quality state of the delivered products, against potential issues related to the in-time response to customer queries or questions.			

Appendix 4: Grouping of Interviewees

Work Stream	Specific Questions	Participants
1) QFD management	a), how do you summarise your role in one sentence, for exactly satisfying customers' quality requirements. b), how have you been playing your role to date for either exactly satisfying customers' quality requirements? c), what is your suggestions for improving your specific situation?	Business Representatives; Chief Engineer; Production Engineers; Purchasing Manager; Quality Engineers/Inspectors
2) Customer personal interaction management	a), how do you summarise your role in one sentence, for becoming a competitive supplier for multiple customers? b), how have you been playing your role to date for becoming a competitive supplier for multiple customers? c), what is your suggestions for improving your specific situation?	Business Representatives; Chief Engineer; Managing Director
3) Supplier relationship management	a), how do you summarise your role in one sentence, for building an effective relationship with suppliers? b), how have you been playing your role to date for building an effective relationship with suppliers? c), what is your suggestions for improving your specific situation?	Purchasing Manager; Financial Manager; Managing Director
4) Employee motivation management	a), how do you summarise your role in one sentence, for improving employees' performance? b), how have you been playing your role to date for improving employees' performance? c), what is your suggestions for improving your specific situation?	Human Resource Manager; Headmen of workshops; Managing Director

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